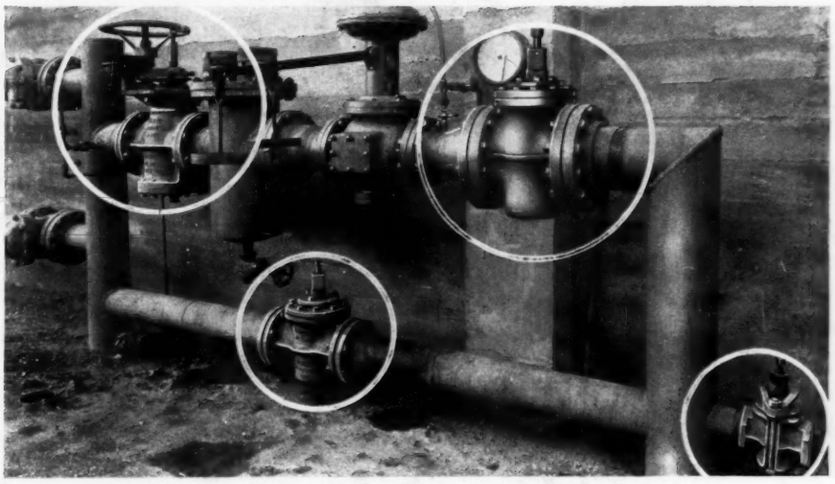
WESTERN GAS

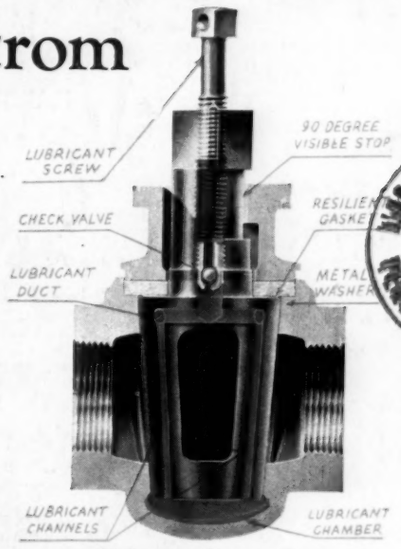
July
1927

20 Cents
the Copy



Merco Nordstrom Plug Valves

.....stop leaks in gas plants...



Lubricant applied under pressure prevents leaks around the plug. Hydraulic pressure of up to 2000 pounds per square inch is exerted, merely by turning the lubricant screw. Desirable for all lines in gas plants; also for governor pits, curb cocks, distribution lines, drips, etc. Ask for catalog.

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"it"

WE WERE really forced to build "it." So many home owners have asked us: "Can't you build 'it'?"

We can and we have.

What is "it"?

"It" is a new idea in gas heating. "It" is a big idea. "It" will increase the gas consumption in your territory. "It" bears the name Estate.

"It" will be announced in detail in this publication in August. Watch for "it"! Or, if you want to plan your house-heating campaign early and you want some inside information right now—write and we'll tell you about "it."

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House Founded in 1845
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"it"

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... equipment and apparatus assure uniform products in the refinery or industrial plant where close control of heating, cooling, fractionation condensation or separation is essential.

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Official Publication Of The
Pacific Coast Gas Association

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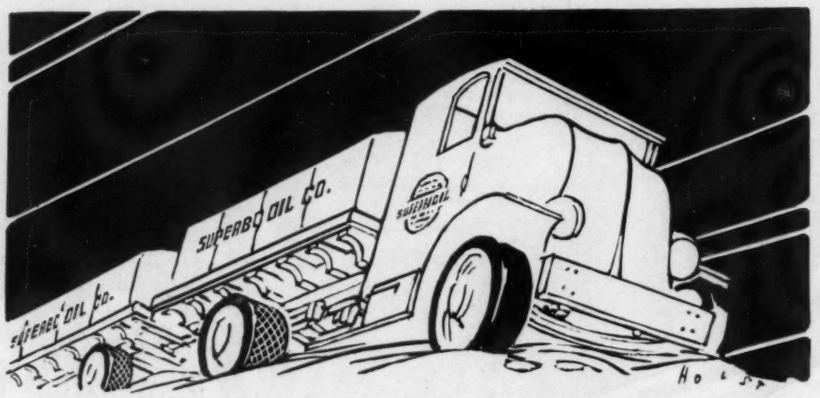

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LOS ANGELES CALIFORNIA

Installation for one of the largest gas companies in the middle west. 12" plain end deLavaud pipe with Dresser type couplings.

The smooth exterior of deLavaud Cast Iron Pipe makes it ideal for use with special couplings

IT has long been a standard practice to use couplings of the Dresser type for high pressure lines.

For water or natural gas lines this joint may be equipped with regular rubber gaskets. For lines conveying manufactured gas, lead tipped gaskets are generally specified.

Write for descriptive literature on special couplings for all purposes

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Build up - your Summer Gas Load

WITH THE NEW

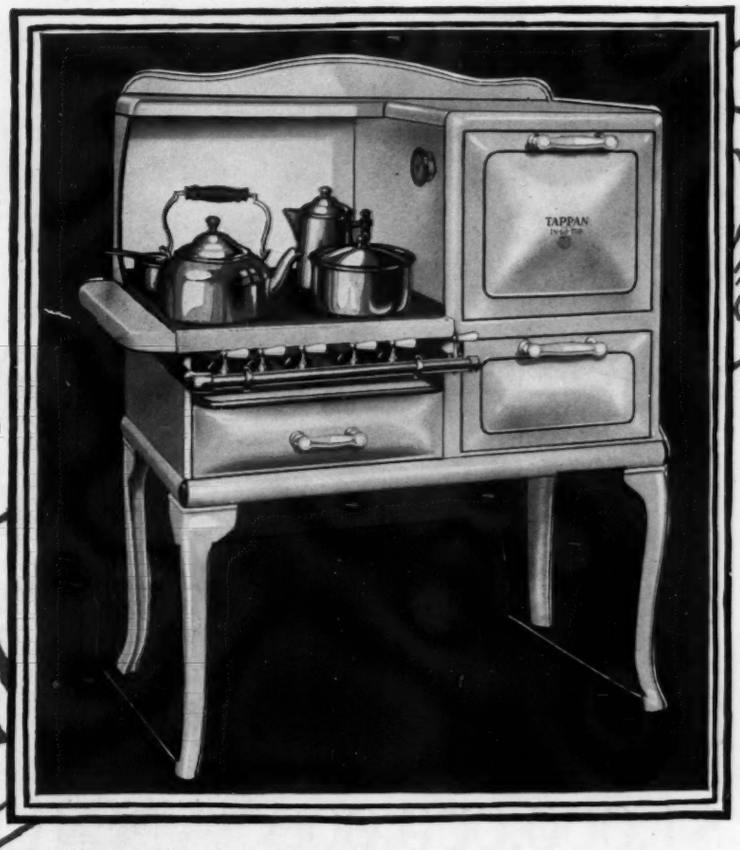
TAPPAN

In-So-Top GAS RANGE

INSULATED
VENTILATED

Keeps heat *in* the oven
and *out of* the kitchen

TESTING LABORATORY
AGA
APPROVED



The oven is VENTILATED *to preserve the fine flavor of foods*

How much money do you suppose the gas industry spent last year to re-popularize the art of home baking? Frankly, we do not know.

But we believe we have developed for gas companies a very direct and profitable way of reaching the desired result. And with that object in view, we present to you, now, the new Tappan In-So-Top Gas Range—INSULATED, VENTILATED.

This new-type range was designed to bring the woman back into her kitchen by keeping the kitchen comfortable. True, the idea of insulation is not new. But heretofore the insulated oven has been a *sealed* oven. And a sealed oven produces flat, steamy flavors of which people quickly tire.

Recognizing this fact, we have developed a scientific method of ventilation for the Tappan In-So-Top Gas Range. Foods baked in the In-So-Top retain *to the maximum* their freshness and fine flavor. *You cannot bake foods better than they are baked in the Tappan In-So-Top!*

Getting Down to Fundamentals

Building up the home cooking load with the Tappan In-So-Top Range does not involve *spending* money. It involves a direct *profit*-taking. Above all, it gets right down to *fundamentals* by making the kitchen a place where the housewife can enjoy carrying on the art of which she is instinctively proud.

If you now have a Home Service Department; if you issue recipes; if you advertise in the newspapers; in short, if you do any of the many things that have been done by gas companies to stimulate home baking, your efforts will be far more fruitful of results when you insure *kitchen comfort* for your customers.

We invite your inquiries about the new Tappan In-So-Top Range. Mailing the coupon will not obligate you. Do it today.

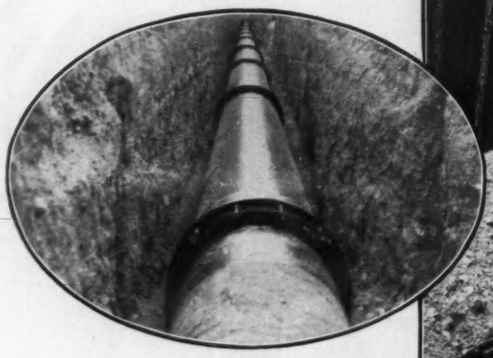
The TAPPAN STOVE COMPANY, *665 Howard St., San Francisco, Calif.*

Without obligation, we would like to receive further information about the various models of the Tappan In-So-Top Gas Range, and your merchandising plan.

*Company*_____

*City*_____ *State*_____

*Attention of*_____



20" Water Line Coated with Biturine New Cornelia Copper Co., Arizona.

World's largest natural gas line coated with Biturine—Inter-State Gas Co.

U. S. CORROSION BILL $1,000,000,000 ANNUALLY

Big Savings Possible with Proper Prevention Methods

The enormous annual cost of fighting pipeline corrosion is one of the biggest present-day problems confronting operators. The destructive action of moisture, acids and alkalis in the soil and electrolysis can only be overcome by the application of a tough protective coating impervious to these harmful agents.

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Biturine Enamel is a complete pipe coating. It is applied hot and it requires no wrapping. Extremely tough but not brittle. Absolutely impervious to corrosive elements.

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Distribution of High Pressure Illuminating Gas

This old-style map shows the trunk lines of the Western United Gas and Electric Co.

Three 30"-stroke Ingersoll-Rand Compressors pump the gas from the plant of the Coal Products Co., Joliet, Illinois. They discharge at 50 to 80 lbs., and send out about 8,100,000 cu. ft. per day.

Elgin is 45 miles from Joliet. From Elgin the gas is pumped as far as Harvard, an additional distance of forty miles and a total distance of eighty-five miles from Joliet.

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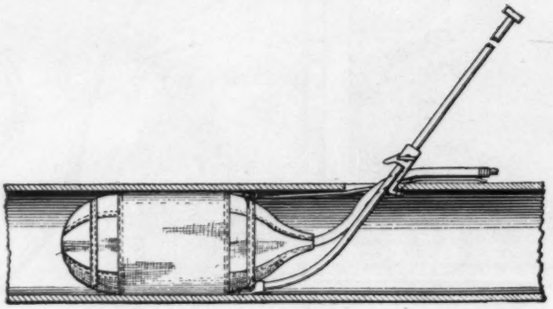

Patents Pending

The Goodman Cylindrical Stopper

An inflatable bag with a fine, strong rubberized casing for use in gas, oil, water and drain pipes. So designed and made that it may be inflated to a high pressure, anchored in place so that it will not creep in the pipe or become displaced, and forming a perfect seal against either gas or liquid. Easily inserted and withdrawn. Only a small tap hole needed.

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Pacific Coast Representative—C. B. Babcock Co., 135 Bluxome St., San Francisco, Calif.

EMCO

CURB BOX METERS

It takes an Emco Cast Iron Meter to stand the Gaff of the Elements

Twenty years of constant exposure to the destructive elements without impairing the efficiency of a gas meter, is the very remarkable record of hundreds of EMCO Curb Box meters throughout the rural districts of the country—a silent but eloquent testimonial of the weather-proof durability of EMCO—the original cast iron meter.

All exposed parts are made of material which will not corrode and in districts where flooding is a constant danger EMCO meters will not be injured by complete submersion.

It pays to install EMCO meters—made to stand the gaff of weather and rough usage.

EMCO

Pittsburgh Equitable Meter Company

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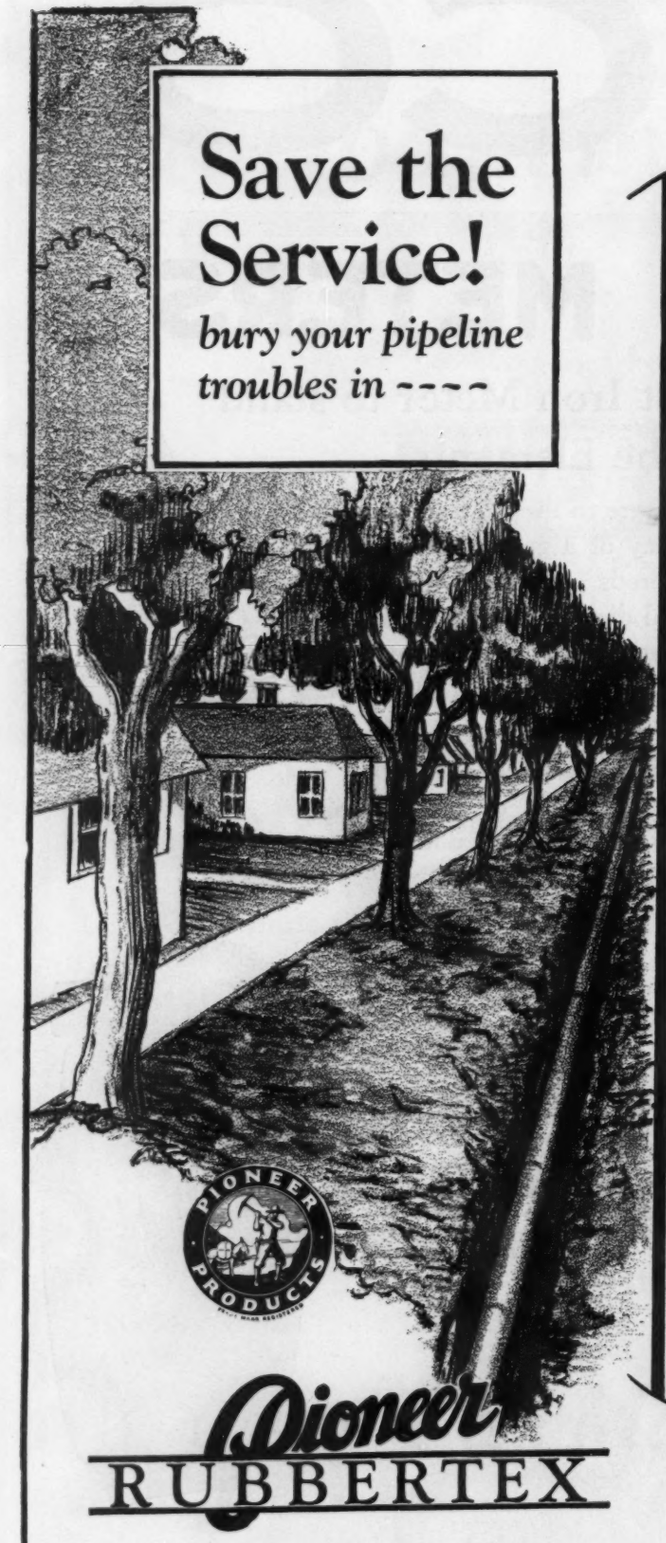

Save the Service!

bury your pipeline troubles in ----

Your buried and exposed pipelines...and all other metal equipment can be made Assets by coating them with Pioneer Rubbertex and spirally wrapping them with Pioneer Pipe Covering.

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These protective features "Save the Service"...they lower maintenance costs and increase the profits on the money invested!

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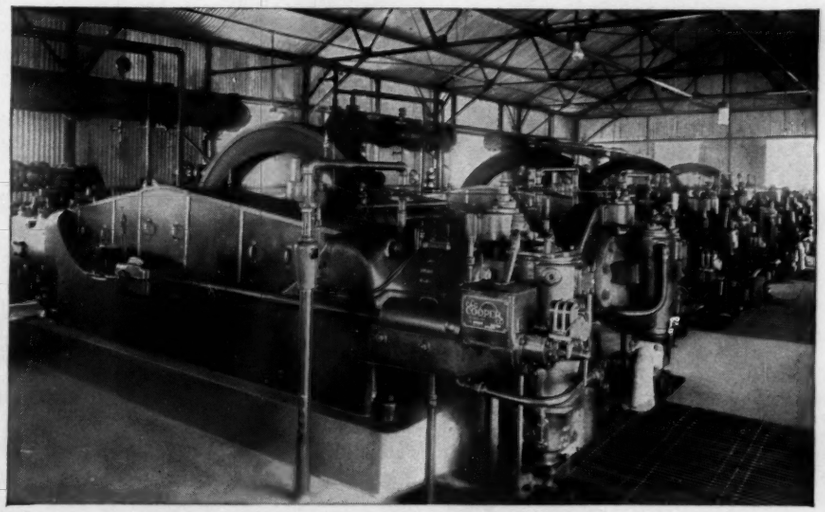


Now Is The Time to Install Coopers—

WHEN prices are low and margins of profit are narrow. It is then that the characteristics of Cooper four-cycle gas engine driven compressors are appreciated most. It is a fact that a Cooper, everything considered, will produce oil cheaper with an air or gas lift or cut the production costs in a gasoline plant.

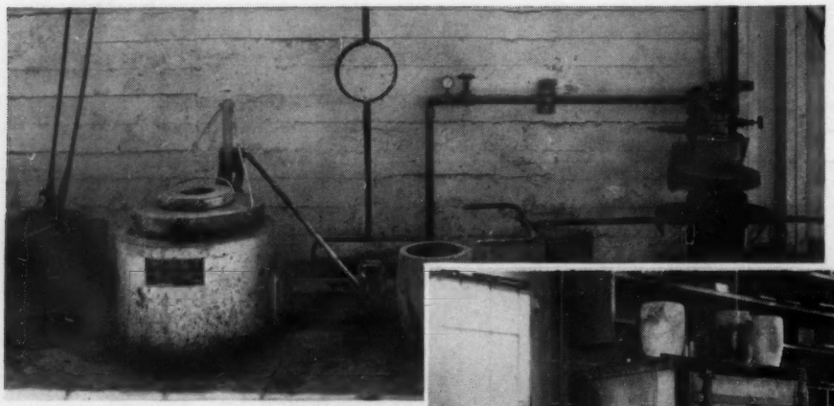
Cooper engines and compressors always make their staunchest friends when their lower operating costs can mean the difference between a profit or a loss. They are built in standard sizes from 45 to 1500 B. H. P.

THE C. & G. COOPER COMPANY, Mt. Vernon, Ohio

1605 Kirby Bldg., Dallas **604 Kennedy Bldg., Tulsa**

649 S. Olive St., Los Angeles

The installation above shows four Cooper 170 B.H.P. gas engines driving compressors for gas lift in Independent Oil & Gas Company, Seminole plant.



Gas-fired brass melting furnace, ladle heater and core oven in the foundry of the Pacific Electric Manufacturing Company, 5815 Third Street, San Francisco.

Electric power transmission parts are made with the aid of Gas

A large amount of the metal moulded in the foundry of the Pacific Electric Manufacturing Company is melted with Gas.

The objects that are moulded include many kinds of copper and brass parts for automatic switches with remote controls, transformers and other high voltage electric power transmission parts.

P.G. and E. engineers will serve you

The same engineering service that helped the above manufacturers is also yours for the asking. Just phone or write to the nearest Pacific Gas and Electric Company office. The engineers have information available on industrial heating operations which have been conducted successfully for many years. This service is at your command without cost or obligation to you.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

IF IT'S DONE WITH HEAT, YOU CAN DO IT BETTER WITH GAS

Snap-O-StaT

Positive hot water control

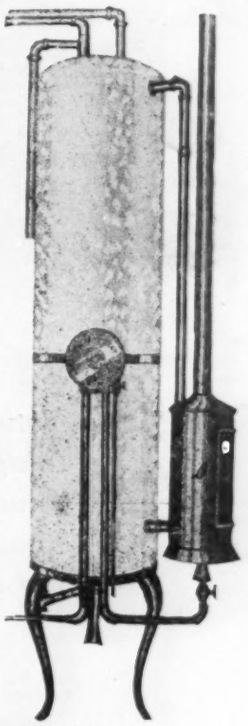
An abundance of hot water at the turn of the faucet. The SNAP-O-STAT makes possible a constant supply of hot water day or night. The tank is always filled with water stored and heated for immediate use.

CONVENIENCE
ECONOMY
SIMPLICITY

Showing SNAP-O-STAT *installation on Standard Combination Heater.*

For use on any storage water heater

The SNAP-O-STAT Automatic Fuel Control valve is especially designed to convert any storage water heater into a reliable automatic at small cost. SNAP-O-STAT can be readily attached to boiler or removed without slightest damage.



How The Snap-O-staT Operates

When the **Snap-O-StaT** is installed you light the pilot, open the gas cock to the main burner, and your water system is in operation permanently. When your storage supply is once heated you have no further concern for the water is always piping hot. The **Snap-O-staT** takes care of your water heating problem, and positively cuts off fire when the proper temperature has been reached.

Gas Appliance Dealers Attention!!

We want dealers in every city and town throughout the United States. Write today for our agency proposition. Many dealers are now selling over 100 SNAP-O-STATS per month. Tune in with our National Sales campaign and watch your cash register ring.

Address

Shaffer-Welch Sales Corporation

354 South Spring St., Los Angeles, Calif.

EXCLUSIVE UNITED STATES SALES MANAGERS

Shaffer-Welch Sales Corporation,
354 S. Spring St., Los Angeles, Cal.

Please send details of your exclusive agency proposition on SNAP-O-STAT.

Name .....

Address .....

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Reliance Manufacturing Co.

Is now constructing in

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The largest plant in the United States (covering three acres) devoted exclusively to the manufacture of

Gas Regulators

Notwithstanding efforts that have been made to create something as good as the Reliance with its toggle joint, valve construction, it still maintains its supremacy where close regulation, large capacity, positive lockup and low cost of upkeep are desired.

House Type, ¾ in to 2 in., single and double opening with three sizes of valve orifices.

High Pressure Compounding—pounds to pounds, from 5 in. inlet to 500 lb. inlet, in sizes ¾ in., 1 in. and 2 in.

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Three Typical Chaplin-Fulton Regulators

We NOW stock the famous

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MEASUREMENT AND CONTROL

The Pacific Policy of Manufacture.

EVERY meter which we produce is a highly finished, perfected and thoroughly tested measuring device.

It is more consistently accurate than a clock, yet exceedingly strong and durable. It is the product of many years' experience and research, the importance of which cannot be over-estimated.

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Nothing short of the best satisfies us in all manufacturing departments. This is what we offer the Gas Industry.

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of the
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Northwestern Representative

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ALL WORKING PARTS
100% Accessible
While in Pipe Line

Every Engineer will appreciate the advantages now offered by Reynolds in the MODEL 10 Series, the latest addition to our complete line. In addition to the complete accessibility of all working parts, all parts are so accurate that they are **interchangeable.** In fact—anything in the way of adjustment or repair may be done while the Regulator is connected in the customer's lines. Details on request.

The Valve Pocket may be removed separately by a turn of the thumb screw.

With or Without Mercury Seal—

Either type is available. Model 10 without mercury seal will give perfect service where inlet pressure does not exceed 5 lbs., the mercury attachment should be specified. These two styles are made either with dead weight or spring type adjustment.

New Efficiency in operation!

A consultation with our Gas Control Engineers may solve your problems. Write!

COMPANY MEMBER OF AMERICAN GAS ASSOCIATION

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Gas Control Since 1892

Reynolds Gas Regulator Company

Anderson, Indiana, U. S. A.

New England Representative: Eastern Service Co., Boston, Mass.

Smoothtop

Reg. U. S. Pat. Off.

Combines the Best Features of Every Type of Range

Smoothtop is a "Blue Star" Range

SMOOTHTOP demonstrates that gas gives a cooking service far superior and more complete than that given by any other fuel, for it combines all the best features of gas, electric and coal ranges.

The capacity of coal stoves; the cleanliness and automatic convenience of electric ranges; with lids off, the instant, intense heat given by open top gas ranges; with lids on, the gentle heat of coal stoves—all will be found in Smoothtop.

And in addition, there is the convenient height of the top that saves backaches, the cooking chart at your finger tips, its new time and work saving cooking methods that strongly appeal to women, its compactness, and smart modern appearance.

Smoothtop's unique, superior and complete cooking service entitles it to a place in every merchandising program, for no other range can fill its place. It should play an active part in your program.

Northwest Gas & Electric Equipment Co.

Pacific Coast Distributors,
Standard Gas Equipment Corporation

372 Pittock Block, Portland, Oregon.

180 New Montgomery St., San Francisco, Calif.

164 So. Central Ave. Los Angeles, Calif.

Write for prices and complete information on this TEEPLE *Thermostat*

The TEEPLE

is the original simple, low priced, room temperature thermostat

Over 10,000 TEEPLE room temperature thermostats are in use on the Pacific Coast. Simple in design, they combine accuracy and permanent reliability

The large number of installations made during the past few years is the best proof of the widespread demand for the TEEPLE thermostat, and its popularity with home and building owners.

Quantity production has brought the price of TEEPLE controls down to a point where sales are largely a matter of suggestion.

We also manufacture magnetic gas valves and complete equipment for the automatic control of gas, steam, hot water, air, oil, or electric heating systems or for refrigeration control.

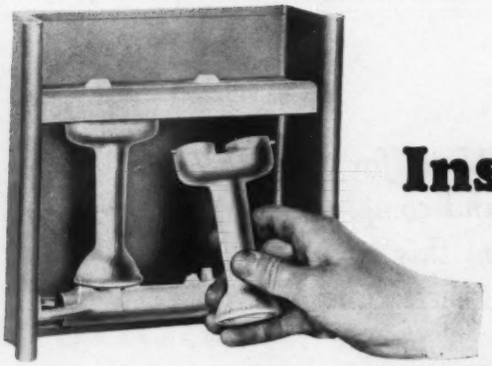
Write us concerning your temperature control problems—we design and manufacture special equipment.

L. R. TEEPLE COMPANY [*formerly* TEPCO *Mfg. Co.*]
540 East 9th Street , , , , Portland, Oregon

TEEPLE TEMPERATURE Controls

TEEPLE

Pacific Coast Distributors for Honeywell Heating Specialties Co



Burners Instantly Removable for Cleaning

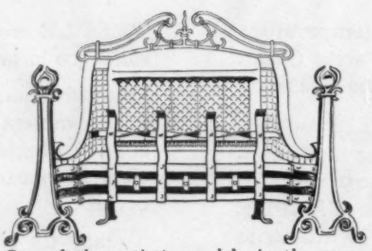
A Big Sales Feature of the New Pacific Radiant Heater Line!

Radiant Heaters in unusually attractive models, designed especially to match the architecture of California homes—are a new addition to our complete line of gas heating appliances. Certain mechanical features of this new line make it especially attractive to dealers.

Back of these heaters is the experience of the oldest and largest gas heating organization on the Pacific Coast—an organization responsible for many of the types of gas heating appliances now in use, plus the inventive genius of J. H. Grayson, superintendent of the Pacific factory, who has developed some of the most valuable patents and is nationally known for his work in this field. Now we have gone into big quantity production on a complete line of the new Pacific Radiant Heaters and our salesmen are just going into the field with a complete line of novel designs particularly adapted to California homes—including Spanish, Italian, Colonial and other period models...

These heaters offer you sales features you have never had before—plus freedom from service grief—and a long profit. Wait for the Pacific representative.

1. Burners require no adjustment.
2. Burners instantly removable for cleaning without tools or removing bolts or screws.
3. Operates on varying gas pressure without affecting combustion.
4. Maximum high temperature flame which is so desirable in a radiant heater.
5. Such simple, safe and efficient construction and operation that service calls are practically eliminated.
6. Installation requires only connection to gas. No further adjustment necessary. This cuts down installation cost.



One of the artistic models in the complete new Pacific line.

Pacific Gas Radiator Company

Gas Heating Headquarters

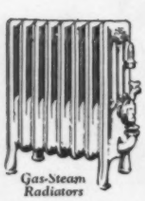
Roseberry and Walter Streets, Huntington Park, California

Los Angeles Agency

Pacific Gas Heating Company

1732-40 W. Washington St.

BEacon 2190



Gas-Steam Radiators

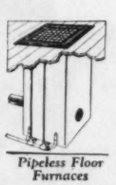
Unit Basement Furnace Systems

Dual Pipeless Furnaces

Fireplace Radiant Heaters

Recess Radiant Wall Heaters

Automatic Storage Hot Water Heaters



Pipeless Floor Furnaces

Gas Radiators—Pressed Metal and Cast Iron

Agencies Throughout the West

Call for a Pacific Heating Engineer

DISPLAY AT METROPOLITAN BUILDING MATERIAL EXHIBIT

MANUFACTURERS of EVERY TYPE of GAS HEATING APPLIANCE

All Vented for Healthful Heat

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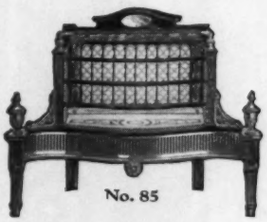
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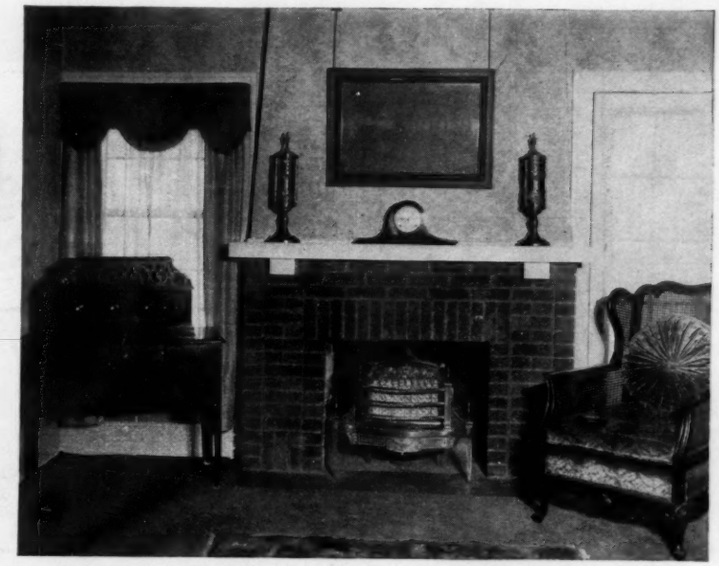

Radiantfire Model No. 90

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No. 30

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Built On Quality

As a member of the Gas Industry, you know the full meaning of the A. G. A. Seal of Approval which is found on all models of the Humphrey Radiantfire. The manufacturers of the Humphrey Radiantfire have built their entire business on **quality.** You, as a gas appliance dealer, can do the same—and watch your business grow stronger year by year.

The HUMPHREY Radiantfire

TESTING LABORATORY · AGA · APPROVED

TRADE MARK REG. U S PAT OFF

Manufactured by
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JEWEL STOVES AND FURNACES — DETROIT STOVE WORKS — LARGEST STOVE PLANT IN THE WORLD

JEWETT

MAGEE

Monarch MALLEABLE

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SUMMIT STOVES RANGES FURNACES — COMBINATION COAL AND GAS RANGES

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THERE are 3 outstanding features in the Wilcolator Oven Heat Control that recommend it strongly to the retailer in gas ranges and commercial representatives of gas utility corporations. These are:

1. Wilcolator equipped ranges give more value per dollar of price.
2. Wilcolator equipped ranges increase the consumption of gas through greater use.
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Send requests for more specific data to Dept. 4 at the address below. No obligation is involved.

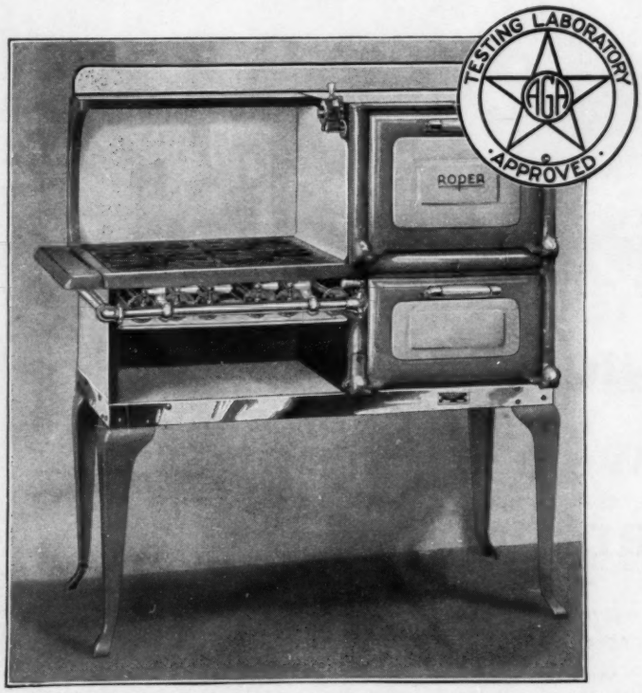
THE WILCOLATOR COMPANY

17-23 Nevada Street **Newark, N. J.**

WILCOLATOR

OVEN HEAT CONTROL

Beauty that Catches the eye—
Features that Create Desire—
Values that Close Sales!



THE NEW ROPER LINE is carrying Roper merchants to the fastest pace of turnover in the history of gas range selling. The remarkable features of these ranges are opening up an unprecedented volume of replacement business, sales to newly married couples and home owners, sales to builders of apartments and single dwellings. Get the Roper catalogue and investigate the profit possibilities in this new, big-value Roper line. Write us.

What ROPER Gas Range is to COOKING the ROPER Furnace is to HEATING

Plan now to launch a real drive for home heating sales. The Roper Gas Fired, Warm Air Furnace will help you capture this growing business—and start your customers broadcasting the desirability of gas for heating. Get the Roper Furnace catalogue and data book now.

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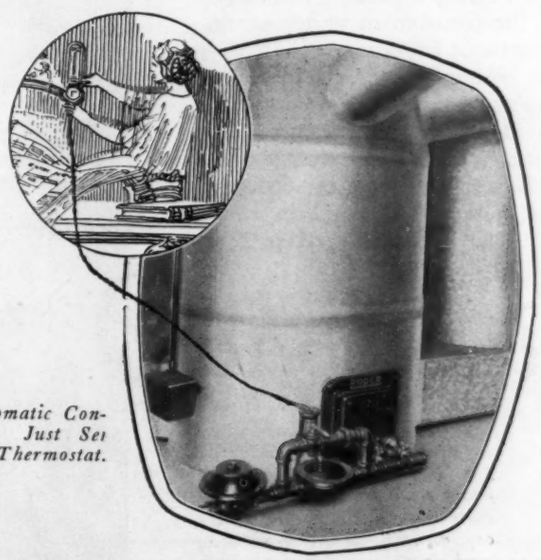
Pacific Coast Branch:
135 Bluxome St. San Francisco, Calif.

ROPER

TRADE MARK REG. U.S. PAT. OFF. REG. IN CANADA

GAS RANGES
GAS FURNACES



Automatic Control. Just Set the Thermostat.

BE SURE THE ROPER PURPLE LINE AND THE ROPER COMPLETE OVEN CONTROL ARE ON THE GAS RANGE YOU SELL

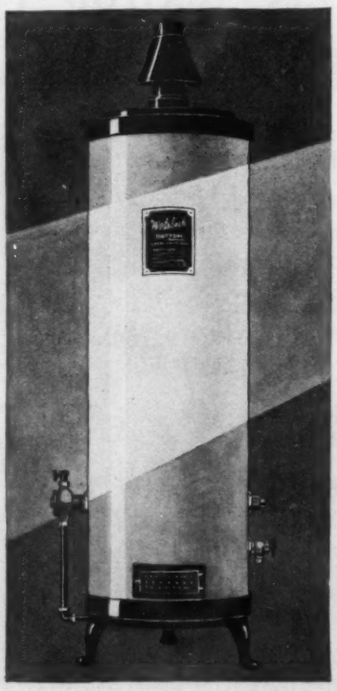
The Candidate
has a lot to do with the success of any campaign

THERE ARE A LOT OF PEOPLE in this free country who have long since voted for hot water. That's easy! But what they want is a candidate worthy of being backed by their dollars.

The qualifications are not complicated. They want a self-action gas water heater. But they don't want a spendthrift, nor a weakling that can't stand the punishment of important office without breaking down.

The voters just seek a plain, wholesome device which supplies hot water at all times—and practices economy twenty-four hours a day.

Welsbach has polled the country and nominated Hotzone because it will fill the bill exactly. Here is a candidate worth campaigning. It has a platform that everyone can understand—*low original cost and low operating cost*. Besides it has a pedigree which improves in the limelight. For Hotzone was born in the Welsbach plant which developed the gas mantle and burner to its peak of proficieny.



The Hotzone self-action heater is so simple in design; so certain of delivering the fullest service any householder could ask; so light on the gas bills; so free of repairs and so reasonable in price that commercial managers who know look upon it as the "man of the hour."

Hotzone is the product of the Welsbach method of getting right into the heart of a marketing condition and then announcing a product only when it meets squarely every condition of price, performance and stamina. Made in four sizes: Fifteen, Twenty, Thirty and Forty-five gallons. For the story in greater detail write Welsbach Company, 863-865 Mission Street, San Francisco.

Welsbach

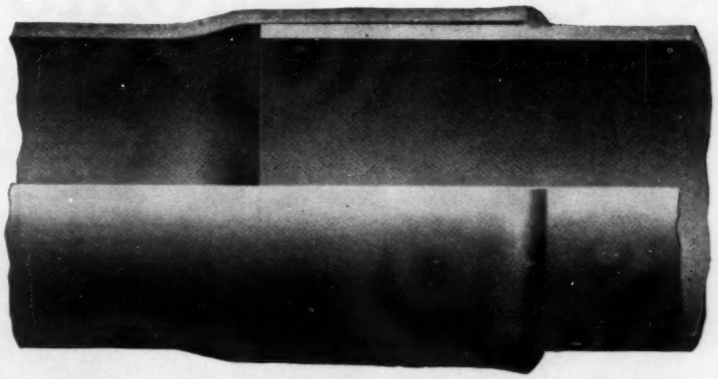
The name famous for two generations as the leader in gas lighting. Now equally prominent in the fields of gas water heaters, gas room heaters, electric lighting fixtures and electric refrigeration.

HOTZONE

SELF-ACTION GAS WATER HEATER

Member American Gas Association
Member Natural Gas Association
Member Pacific Coast Gas Association

"Production Builders"



For Long, Safe and Permanent Pipe Lines

American Seamless Line Pipe

Reduces Contruction and Up-keep Costs

SOLID billets of Siemens-Martin steel are the base of American Seamless Line Pipe, which, by the Mannesmann Peircing and Pilgering process are literally forged into extra long lengths of seamless, non-corrosive line pipe, of high tensile strength which will withstand the highest pressures from within or without.

Because of extra long lengths and slip joints, easily and quickly welded on the job, American Seamless reduces assembly time and construction costs. Being less affected by the chemical action of fluids passing through it, or by adverse soil or climatic conditions, its life is practically unlimited, and repairs and maintenance expense are reduced to the minimum.

Supplied in all diameters to 18-in., and in random lengths averaging 40-ft. Ample stocks for immediate delivery. Wire, write or phone your requirements. Specifications and all data contained in American Seamless Literature which will be mailed on request.

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American Seamless Tube Corporation of California

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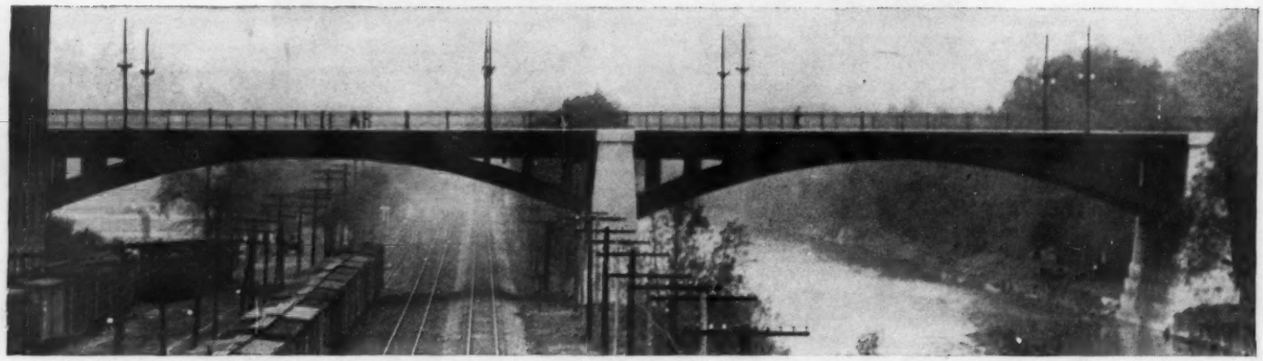
Steere Steel Pipe Bridges Don River for Toronto's Gas



The Consumers' Gas Company has ordered the Semet-Solvay Engineering Corporation to furnish half a mile of 16″ Steere Steel Pipe for two mains to carry gas over the East York-Leaside Bridge.

This will be the second Steere-built gas main over the Don River.

Bridge piping demands extraordinary quality. Taking chances on anything but the best in design and materials is out of the question. This explains why Steere Steel Pipe, joined by Steere Van Stone Flanges and Steere Expansion Joints are specified for so many jobs.

Whatever your piping problem—whether for gas, steam, air or water; for a short stretch or a mile; for lines twisting around plant equipment or stretching across country—Steere Steel Pipe and Fittings can be built to your need.

Service is rapid too. Sizes up to and including 36″ are stocked.

Skilled workmen will install it perfectly—simple connections will keep down field costs.

SEMET-SOLVAY
ENGINEERING CORPORATION
Division Allied Chemical and Dye Corp.
40 RECTOR ST. NEW YORK

WESTERN GAS

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

Gas Transmission Developments Hold Center *of* Stage *in the* West

By GEORGE H. FINLEY
Managing Editor, WESTERN GAS

WITHOUT exaggeration it can be said that during the last year there has been more newspaper space devoted to gas transmission projects than in any equal period of gas history in this country. Many new fields have rewarded the unceasing search of the petroleum drill, and new stores of fuel wealth in the form of natural gas have been made available, bringing utilization problems to the fore in the interests of conservation. In some cases the proving of new gas acreage has meant the consummation of plans long in the minds of existing pipe line companies — plans which involve the investment of millions of dollars in the laying of hundreds of miles of main. In other cases the gas geologist has sought out new acreage on his own initiative, to supplement gas supplies made available through oil development, all to the end that the industrial and domestic fuel needs of distant communities might be better served.

Western America, with its generous resources and its mushrooming population, is fittingly the scene of this unprecedented gas transmission activity. From the Mississippi to the Pacific come the reports of new pipe line projects, some of them of mere local concern, others crossing more than one state boundary to augment existing gas supplies or to add new communities to the thousands which already enjoy gas service.

Map showing Colorado, Texas, and Wyoming gas transmission enterprises which are either completed, under construction, or projected for Prairie Oil and Gas Company and affiliated interests.

The purpose of the following paragraphs is to give the high lights of the major gas transmission enterprises which have been engaging the attention of gas men in various parts of Western America in recent time, both those which are already completed or well under way, and those which are still in the project stage.

Outstanding, perhaps, among the many gas line enterprises of "first page" importance is that of the Empire Gas & Fuel Company which will bring gas from the Amarillo fields of Texas to tie into the company's system at Wichita, Kansas. The 250-mile line begins at a point near Pampa, Texas, running in a northeasterly direction through Woodward, Okla. and Anthony, Kansas, connecting with the Empire system near Wichita and extending thence to Ottawa, Kansas.

A map on the opposite side of this page shows the course of this mammoth line, which is now under active construction. Ditching and pipe stringing operations began early in June, and the line is expected to be in service by January 1, 1928. It will add some 70,000,000 cubic feet to the Empire daily delivery, increasing supplies for industry in Kansas City and other points. Cost of the project is amounting to $15,000,000.

Five compressor stations with a total rating of 13,000 horse-

Principal transmission lines and gas fields supplying the Lone Star Gas Company system, the largest in North Texas, are indicated on the map above.

power, will boost the gas from its Texas origin to its destination along the route of the line. The compressor equipment has already been contracted for with the C. & G. Cooper Company, of Mt. Vernon, Ohio, and according to that firm constitutes the largest single order ever placed for this type of equipment. The gas engine driven equipment consists of eleven 1000-H. P. units and four 500-H. P. Six 190-H. P. auxiliary electric units are also included in the order.

At Ottawa, Kansas, a 4000-H. P. compressor station is already in process of building, on the lines of the Kansas Natural Gas Company, an Empire subsidiary, and is the first of the group of five for the Amarillo line. It will contain four 1000-H. P. twin tandem double-acting C. & G. Cooper gas engines, direct connected to eight 16 by 36-inch double-acting Cooper gas compressors, and will have an approximate capacity of 75,000,000 cubic feet daily.

As a result of the Texas line and other lesser extensions to new gas sources the Empire's gas capacity will be raised to about 200,000,000 cubic feet daily, practically double the present, enabling the affiliated companies to take on more industrial consumers, and insure ample reserve capacity for domestic service throughout their extensive territory in Kansas, Missouri and Oklahoma.

Another sizeable transmission project, and one but recently completed is that of the Interstate Natural Gas Company, Inc., of Monroe, Louisiana, which extends from Fowler, in the center of the Monroe gas field, to North Baton Rouge. The line is 170 miles in length, and was built primarily to serve the refinery of the Standard Oil Company of Louisiana at Baton Rouge. It is constructed of 22 inch O. D. plain end pipe jointed with Dresser couplings, except where it passes through swamp lands, where it is split up into a number of smaller lines to permit easier access for maintenance purposes.

The capacity of the line is approximately 75,000,000 cubic feet per twenty-four hours, which can be increased if necessary by the installation of additional compressor stations. At present one compressor station has been constructed, containing a duplicate station is projected for construction at Ferriday, which is half way between Fowler and Baton Rouge.

The line crosses the Mississippi River below Natchez, the crossing consisting of four 10-inch screw lines, with four more lines to be constructed this summer.

Ford, Bacon & Davis, Inc., who built the above line for the Interstate Natural Gas Company, Inc., are constructing another large line, from Baton Rouge south of the refinery of the Mexican Petroleum Company of Louisiana at Destrehan, some 72 miles below Baton Rouge. This line is 18 inches in diameter and will serve three sugar refineries located between Baton Rouge and Destrehan, beside the refinery above mentioned.

The Magnolia Gas Company has completed a 210-mile telescope welded line from Northeast Texas and North Louisiana to Dallas and Forth Worth, gas being turned into the city mains about June 15. The line is of 14-, 16-, and 18-inch pipe and brings gas to industrial users only.

200-MILE LINE FOR PRAIRIE O. & G.

Prairie Oil & Gas Company has a major gas line enterprise under way, from a point 28 miles north of Amarillo, Texas, extending some 200 miles south to Lubbock, and bringing gas to Lubbock, Slaton, Plainview, Lockney, Floydada, Hale Center, Abernathy, Tulia, Kress, Canyon, Happy, and other communities of the vicinity. This line, which is estimated to cost about $6,000,000, will be 16-inch from the gas fields to Amarillo, 14-inch to Plainview, 12-inch to Lubbock, and 8-inch to Slaton and out to Floydada. It is understood that the line will be operated under the name "West Texas Gas Company," which was the name of the company which secured franchises taken over by the Prairie. About 50,000,000 cubic feet daily will be carried by the line.

Rio Grande Valley Gas Company, which holds franchises to supply gas to about fourteen communities in southern

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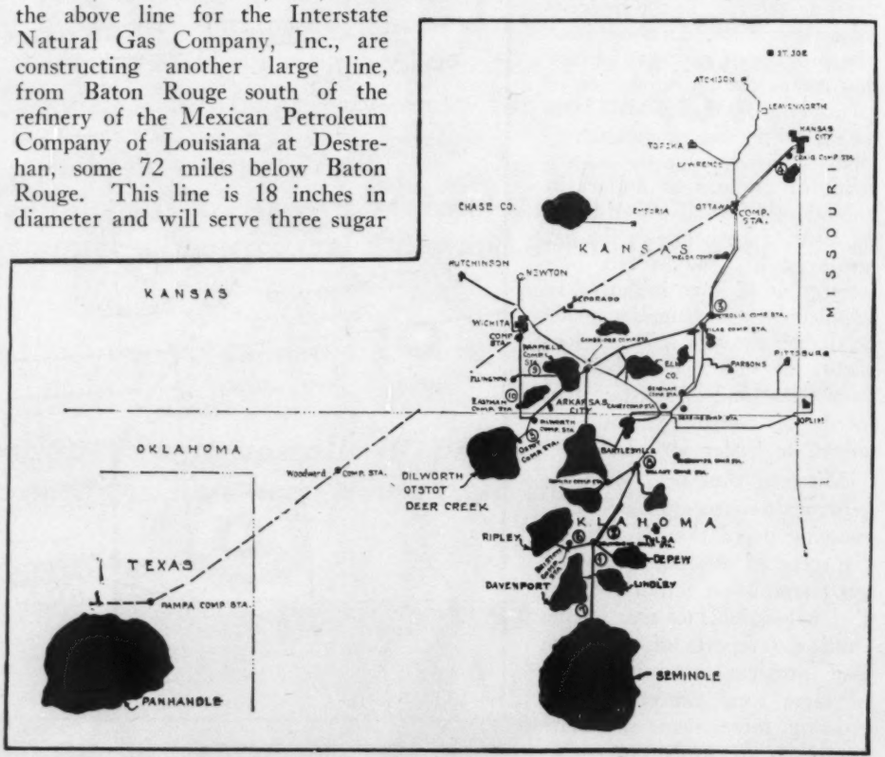


Above are shown the main gas lines of the Empire companies, with gas fields shown in black, and the new 250-mile line now building from the Amarillo fields to Ottawa, Kansas, designated by the broken line.

The Gas Company *and the* Dealer

By CLIFFORD JOHNSTONE
Executive Secretary, Pacific Coast Gas Association

Clifford Johnstone

WHEN in about 1880 the electric light first began to make itself seriously felt as a competitor to gas, the gas men saved their business and investment by encouraging their customers to cook with gas. The gas stove was introduced and with it a problem which has been and still is in many localities a source of much friction and the cause of endless debate. The problem is: Who shall sell appliances to the consumer, the gas company or the established retailers? The ideal has never been better defined than by John D. Kuster in his Presidential address to the Pacific Coast Gas Association in 1919.

> "The consumer will need the assistance of experts in choosing his appliances and in learning their economical operation. Whether the dealer or gas company or both distribute appliances to the consumers of gas is not material provided the consumer is given the best appliance, a proper installation of it, correct prices, efficient service in operating it, and a stimulating and active growth is maintained in gas sales."

HARD WORK THE ANSWER

The answer to the problem was given in 1896 by C. H. Nettleton when he closed a very complete paper on the subject before the American Gas Light Association by saying:

> "When I started this paper I thought it possible to prove one system better than any other . . . . I became convinced that the facts would not warrant any such conclusion. There are a number of good plans and the whole question of success . . . . turns on the quality and quantity of work with which the plan is pushed. . . . A reasonable amount of ability and an immense amount of hard work will bring success with almost any plan."

This solution is of course not a patent medicine specific and because it required the exercise of both ability and hard work it was not universally applied. The problem continued to be a problem and the weariness which greets each new statement of it is implied in the words of John A. Britton who said, after listening to the 1922 version at a Pacific Coast Gas Association Convention:

> "I closed my eyes, I went back twenty-five years and everything that was said then has been repeated here this morning . . . . I had rather hoped that those problems might have been solved before this time."

It is hard for us to realize that in 1880 the gas stove was a novelty and that its development period extended over nearly twenty years. Gas companies gave stoves away, they leased them, they rented them, they sold them at cost and less than cost. The arguments in the early days dealt entirely with the relative merits of these various plans and the dealer did not enter the picture at all until the public had been fairly well sold on gas stoves and their wide use had encouraged a number of manufacturers to enter the field, each one desiring a retail outlet in every good gas town. The only available retailers at first were the plumbers, but soon the hardware merchants were persuaded to stock a few gas stoves. It was a long time before the business became important enough to attract the furniture and department stores and in the meantime the water heater had been developed and the gas companies had started their bid for the househeating business, all of which made the gas appliance line well worth while as a merchandising proposition.

The controversy which arose everywhere was not in many instances well handled either by the gas company or the dealers. The gas company realized that its life depended upon the development of gas cooking and was loath to entrust the placing of stoves to inexperienced dealers. The dealers in turn spent their energy in trying to force the gas company out of the business by selling cheap and inadequate stoves, poorly installed, thus merely justifying the gas company in its original position. A review of what literature there is on the subject reveals that it is not a complicated problem except that it involves the human element. The arguments advanced by the dealers can be quite completely summed up as follows:

THE DEALERS' VIEWPOINT

The average gas company is an unwieldy corporation with an organization not suited to engage efficiently in a merchandising business. The coal companies do not sell coal stoves, nor the oil companies oil stoves and automobiles. The retailing of merchandise is a legitimate business with established channels through which it should invariably flow if it is to be conducted efficiently and in satisfactory volume. The gas company which leaves the appliance business exclusively to the dealers adds to its sales force without cost a number of efficient, established merchants each with a clientele and each with a strategically situated showroom which together cover the community. These merchants are invariably men of standing in the community and their active friendship is worth a great deal from a public relations standpoint just as their antagonism is harmful. The gas company also frees itself of the burden of gratitous service thrust upon it if it sells appliances. This service can be charged for by dealers. It also releases capital tied up in appliance stocks and avoids the numberless causes of complaint which may arise from an appliance transaction which for some reason or other has proven unsatisfactory to the buyer. The dealers' sales and service organization is made up of men and women just as is that of the gas company and is therefore just as amenable to education on sales and installation methods. The dealer is even more interested in maintaining his prestige than is the gas company, and while the profit on each sales transaction is his principal interest, yet no reputable dealer would knowingly jeopardize his future by selling unserviceable appliances or by failure to remedy any faulty condition. History shows that gas companies have made faulty installations. The installment selling plan now so widely used tends further to insure that the customer will receive proper service.

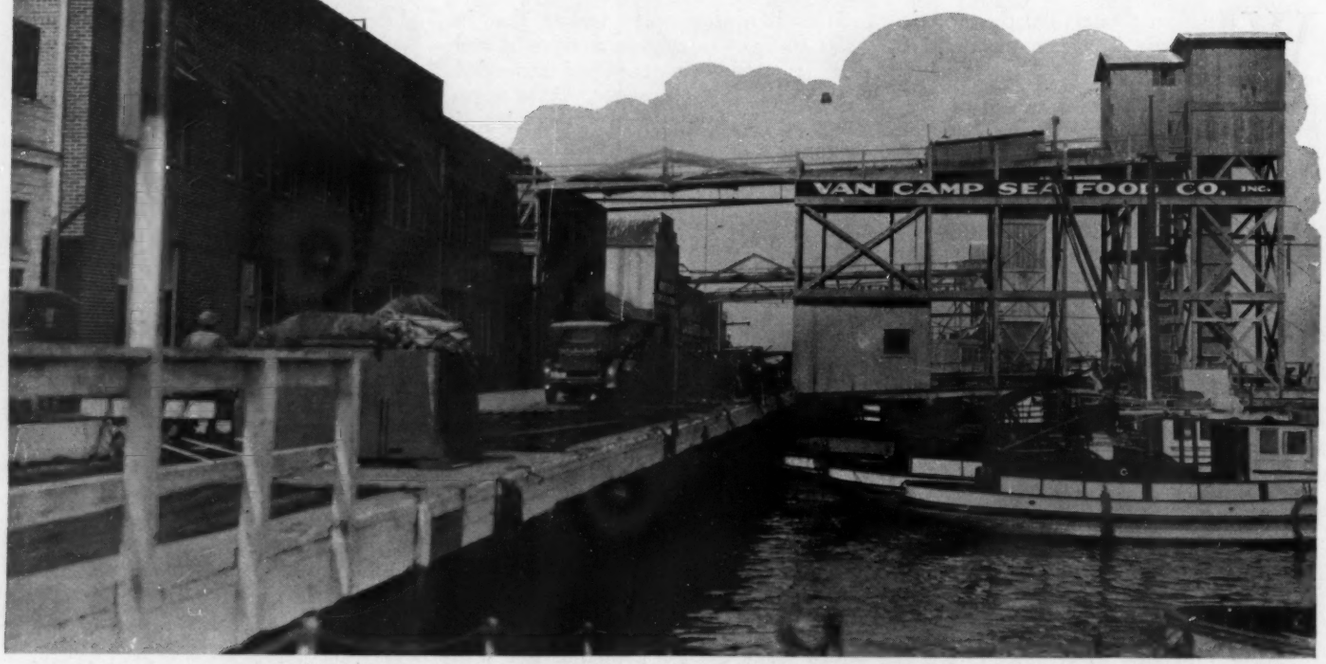
The arguments on the other side can be summarized with equal brevity:

The public service company is in an unique position among business enterprises because it is selling a completed

(Continued on Page 62)

Canning Fish *by* Gas

By O. R. C. GROW
District Manager, Southern Counties Gas Company, San Pedro, California



ABOVE: *General view of Van Camp Sea Food Company's plant at Fish Harbor, East San Pedro, Calif.—a large industrial gas user.*

IT IS general knowledge that San Pedro, the port of Los Angeles, in a comparatively short time has grown from an insignificant local harbor into a great world port. It is not so generally known however that the center of the fishing industry in the past few years has moved from Boston to this same port. The amount of fish handled through this port is stupendous, the money invested is enormous and the importance of the industry is realized by very few who are not immediately connected with it.

The sardine catch makes by far the largest tonnage handled of any one fish. Sardine season lasts from October until April in normal years, though this year sardines were being canned until the latter part of May. The Albacore and Tuna season is from June 15th to Sept. 15th.

A RECORD PACK

During the year 1925 there were brought into the local port and canned 174,403,208 pounds of sardines—a banner year. In 1926 the yield was 113,494,174 pounds, which is about the normal catch.

These fish are all caught in local waters; that is, within a radius of a hundred miles, in running nets. The usual catch being from one to fifty tons, though a record catch was made this season of 267 tons in one haul.

Now you are asking yourself what have sardines, and fish in general, to do with the gas industry. The answer is that every cannery operating in the Harbor District is using gas as fuel under its boilers and in its fertilizer units. The combined total rated horsepower is 3000 and the actually developed horsepower close to 6000.

We have been fortunate in that all the canneries are located along or within easy reach of an eight-inch transmission main which carries a minimum pressure of twenty pounds. The service line is either four-inch or three-inch according to the load expectations. Two-inch or three-inch Emco regulators are set at the meter location, which consists of a battery of No. 50 Westinghouse oil-sealed meters.

The house line from there to the point of consumption is three or four-inch and carries a pressure of from five to twelve pounds.

Every boiler installation is equipped with either the Chaplin-Fulton or another type of gas-steam regulator, which holds the steam pressure to any desired number of pounds regardless of load fluctuations.

This makes for practically automatic operation, hence is very popular with the engineer, especially if he has operated with fuel oil (with base sediment and water) requiring constant attention. Most installations using fuel oil have an oil-steam regulator on them but with cold oil, steam jets, heating coils, pumps and sediment the installation might as well not be there.

DAY PEAK IS BAD FEATURE

Practically the whole cannery load is a daytime load coming on between 7:30 and 8:00 a.m. and going off between 4:00 and 8:00 p.m. Our peak day for the last sardine season was 3,700,000 cu. ft. This day peak is the only bad feature of the cannery load.

The general boiler installation is 4″ H. P. Bunsen burners though there are a number of Mettler, and other installations.

The fertilizer installations are, with one or two exceptions, Bunsen burners

from 3″ to 6″ with varying pressures from 5 pounds to 12 pounds.

Feeling that readers of *Western Gas* would be interested in a general description of how the sardines are handled, the process from the boat to the finished product will be described briefly. A bucket elevator extending into the hold of the modern boat raises the sardines to the top of the cannery where they pass over an automatic weigher from which they are washed in a flume into the cutting rooms where they are cleaned and the heads removed. They are then thrown into a revolving screen which removes the scales, after which they go into a brine tank where the meat is whitened and they are salted to taste. On being removed from the brine tank they go into a dryer, which is a traveling screen sixty feet long completely housed in, with a force fan for draft and a Bunsen burner for heat. It takes the fish approximately forty-five minutes to travel through the dryer. As they come out of the dryer the fish are packed into baskets four inches deep by eighteen by thirty-six inches which are placed on a conveyor traveling through a bath of hot olive oil. This olive oil bath extends about two inches below the conveyor and lays on top of twelve inches of water. Steam pipes run through the oil, heating it to a frying temperature and any particles which drop off the fish instead of remaining in the bath to become blackened and burnt, sink into the water, leaving the oil clear at all times. When the fish leave the oil baths they are stacked in tiers of screen containers and allowed to cool, after which they are taken to the packing tables. There they are packed by hand into long flat cans. When a packer has completed a certain number the checker opens a little door and shoves the cans through onto a conveyor. The can travels down the conveyor to a device which puts tomato sauce into it, then on into a steam box where exhaust steam expels all the air. The can there has the lid clamped down on it and goes to the retort where it is cooked for one and one half hours at a temperature of two hundred and forty degrees, in live steam. The finished product is then ready to be lacquered and labeled.

The refuse from the cutting room and a certain percentage of whole fish, not to exceed twenty-five per cent of the catch, goes into a screw conveyor which, traveling in live steam, cooks the whole mass. Thence it passes into presses where the oil and water are squeezed out to go to tanks where the oil overflows at the top and the discharge from the tank goes to the sewer. The pulp from the presses goes to a revolving dryer through which it travels, coming out completely dried, after which it is ground and sacked for fertilizer.

BELOW: *Boiler Installation at Ocean Products Inc., San Pedro, Calif., consisting of two 250 H. P. boilers each equipped with three blast-type combination gas and oil burners.*

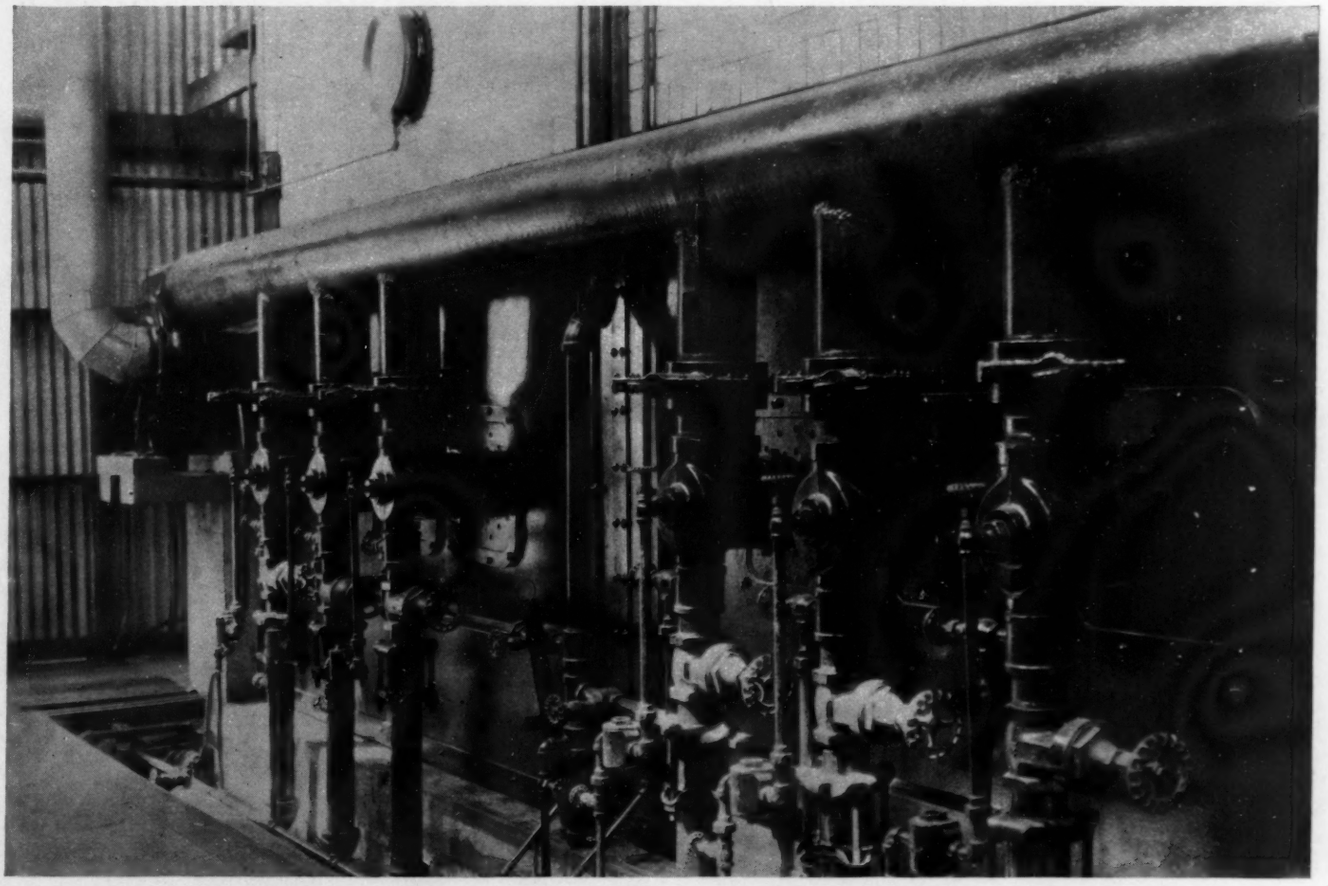
HANDLING TANK DISCHARGE

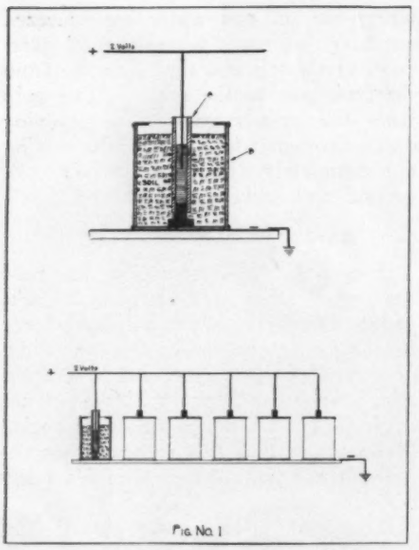
A recent development here has been the organization of a company to take the tank discharge which ordinarily went to the sewer containing fine quantities of suspended fish matter and by evaporation, reclaim an additional large amount of fertilizer. During the short period of operation that this company has enjoyed it has proved the entire feasibility of its process.

The installation at the above plant consists of six burners, three under each boiler, the rated capacity being 250 horsepower each, their actual capacity being 500 horsepower. The burner is a blast type which can be used for either oil or gas The air intake for the fan is built around the smokestack thus sending hot air to the burners for which an eighty-two per cent efficiency is claimed.

As I mentioned earlier, the general boiler installation is of the Bunsen type, mainly because the company installs

(Continued on Page 63)





Soil testing apparatus devised by Southern California Gas Company

Testing Soil *for* Corrosive Effects

By B. G. WILLIAMS
Chief Engineer
Southern California Gas Co.

A THEORY which has become wide credited among men concerned with corrosion problems is that a soil corrodes pipe metal in proportion to its ability to conduct electric current. On this assumption, the Southern California Gas Company has been doing some progressive work in determining the corrosiveness of soil and its effect upon pipe lines.

Back of the effort to accurately test soil for corrosiveness, in advance of laying of pipe lines, is of course the desire to know the degree of protection they will require to eliminate the practice of continually preparing for the worst conditions, and thus to make a great saving in the material used in covering pipe lines.

In order to substantiate this theory our chemists made up a soil testing apparatus as shown in figure No. 1. In this the sample of pipe "A" was thoroughly cleaned and placed in a container "B." The container held one pint. A cork stopper at the base of "A" insulated it from the container. In order to get a good electrical connection mercury was poured into the pipe "A" and a wire inserted in the mercury. This wire was connected to a circuit carrying a two volt current. The container "B" was grounded.

The soil to be tested was then placed around the pipe and thoroughly moistened with distilled water. When the current was turned on, the pipe "A" became the cathode and "B" the anode, the saturated soil being the solution.

Tests by this method showed that when the pipe sample was buried in clean sand there would be an approximate loss of only a few hundredths of a gram of metal from the pipe "A" in twelve hours.

Taking samples of soil from locations where our pipe lines had a life of from twenty to thirty years and using these in the test set, it was found that the loss of metal from the pipe was from 0.1 to 0.2 of a gram of metal from the pipe "A" in twelve hours.

In soil from locations where 2-inch pipe had been pitted through soil conditions, in about eight years, is was found that approximately 0.34 grams of metal was taken from the pipe in twelve hours.

The worst soil which had been encountered on our system, which supplies seventy-four municipalities and consists of more than 2,900 miles of main, is one wherein 2-inch pipe had been pitted through in about two years. By using a sample of this soil in the above test set, 1.48 grams of metal were taken from the pipe in twelve hours.

In all the above instances all pipe lines had been oiled or painted at the time of laying. This affected our results to a certain extent. However, in these cases and many others it was found that the amount of metal taken from the pipe seemed to bear a close relation to the corrosiveness of the soil.

B. G. Williams

It was now decided that we had sufficient knowledge concerning this method to permit using it in advance of laying our pipe lines.

The first trial was made in laying a 16-inch line approximately twenty miles long. This extends along the Ventura Highway from Calabasas to the intersection of Laurel Canyon and Mulholland Drive. It is to be used in connection with the Ventura Fuel Company's line in the transportation of 40,000,000

(Continued on Page 67)

TABLE 1—SOIL TESTS

No. of Sample	*Character of Soil*	*Location*	*Loss in Wt. in Grams under 2 volts in 12 hrs.*	*Remarks*
1.	Black Clay Loam	Ventura Blvd. at Calabasas	0.77	Specimen
2.	Clay Loam	Ventura Blvd. Sta. 30 plus 00	0.20	moist from
3.	Stratified Clay	Ventura Blvd. (Chalk Hill)	0.86	recent
4.	Clay Loam	Ventura Blvd. (Amestoy Ave.)	0.19	rainfall
5.	Heavy Clay Loam	Laurel Terrace Drive at Rhodes Ave	0.45	
6.	Sandy Clay	Laurel Canyon Drive at Sta. 43 plus 9342 (under Edison Power Line)	1.38	
7.	Decomposed Rock and Gravel	Laurel Canyon Drive at Sta. 60 plus 4383	1.02	
8.	Decomposed Rock and Gravel	Laurel Canyon Drive at Mulholland Drive	0.35	

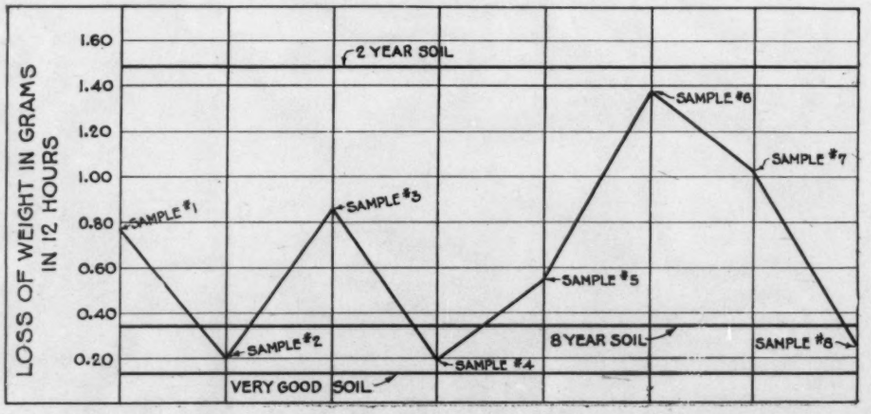


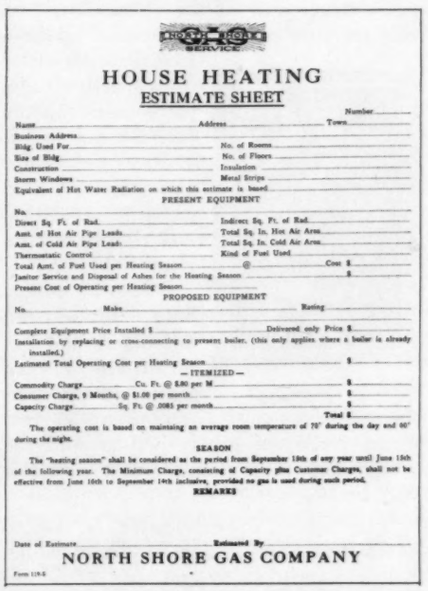
Figure No. 2. Plotting the comparative corrosiveness of soils on new line route

Selling *a* Complete Gas Service

By G. C. KLOPF
Commercial Manager
North Shore Gas Company
Waukegan, Illinois

GAS companies which have thrown their hats whole-heartedly into the appliance merchandising ring are coming more and more to appreciate that they must sell a complete gas service to their consumers. While persistent sales effort will build load on existing lines by putting additional appliances into homes of present users, it is evident that the ideal time to strike most effectively for a complete gas service is when the new residence or other structure is about to be built.

The North Shore Gas Company, serving five communities of Illinois—Waukegan, Highland Park, Lake Forest, Libertyville and Winnetka—more than a year ago inaugurated a sales activity designed to sell group merchandise, an activity which is a direct tie-in with the Blue Star Plan which has been launched by the American Gas Association. This innovation is in the form of a Gas Specification Booklet, compiled for each new building or residence by our local salesmen, where the prospective customers are in the market for three or more appliances, and our experience has been that the Booklet is a highly effective sales aid in selling a complete gas service.



HOUSE HEATING
ESTIMATE SHEET

Number
Name Address Town
Business Address
Bldg. Used For No. of Rooms
Size of Bldg. No. of Floors
Construction Insulation
Storm Windows Metal Strips
Equivalent of Hot Water Radiation on which this estimate is based

PRESENT EQUIPMENT

No.
Direct Sq. Ft. of Rad. Indirect Sq. Ft. of Rad.
Amt. of Hot Air Pipe Leads Total Sq. In. Hot Air Area
Amt. of Cold Air Pipe Lead Total Sq. In. Cold Air Area
Thermostatic Control Kind of Fuel Used
Total Amt. of Fuel Used per Heating Season @ Cost $
Janitor Service and Disposal of Ashes for the Heating Season $
Present Cost of Operating per Heating Season

PROPOSED EQUIPMENT

No. Make Rating
Complete Equipment Price Installed $ Delivered only Price $
Installation by replacing or cross-connecting to present boiler. (this only applies where a boiler is already installed.)
Estimated Total Operating Cost per Heating Season $

— ITEMIZED —

Commodity Charge Cu. Ft. @ 8.80 per M $
Consumer Charge, 9 Months, @ $1.00 per month $
Capacity Charge Sq. Ft. @ .0085 per month $
Total $

The operating cost is based on maintaining an average room temperature of 70° during the day and 60° during the night.

SEASON

The "heating season" shall be considered as the period from September 15th of any year until June 15th of the following year. The Minimum Charge, consisting of Capacity plus Customer Charges, shall not be effective from June 16th to September 14th inclusive, provided no gas is used during such period.

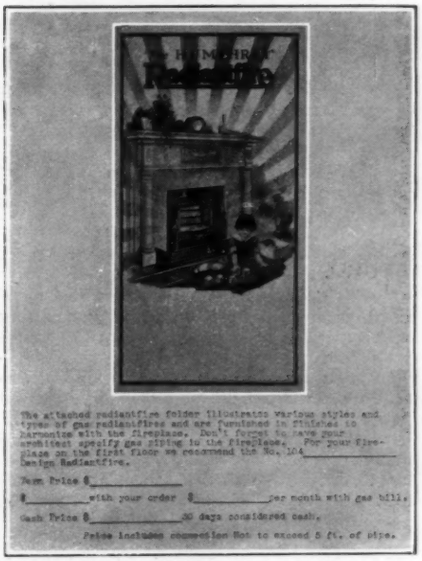
REMARKS

Date of Estimate Estimated By

NORTH SHORE GAS COMPANY

Form 119-G

Page for house heating data, from North Shore Gas Co. booklet



The attached radiantfire folder illustrates various styles and types of gas radiantfires and are furnished in finishes to harmonize with the fireplace. Don't forget to have your architect specify gas piping in the fireplace. For your fireplace on the first floor we recommend the No. 104 Design Radiantfire.

Term Price $
$ with your order $ per month with gas bill.
Cash Price $ 30 days considered cash.
Price includes connection Not to exceed 5 ft. of pipe.

Typical page from Specification Booklet, showing gas appliance manufacturer's folder

Our Specification Booklet, which is made up in loose leaf form, puts under a single cover all the information the prospect may desire on cooking, heating, incineration, water heating, laundry equipment, piping, etc. Because it has neatness and individuality to commend it, the Booklet is preserved and is constantly at hand to be consulted in making selection of gas appliances. Even under the most ideal circumstances the individual salesman cannot always seize upon these opportune times to make his solicitations.

A stiff folder of good quality covers the Booklet, and the only note of advertising appearing on the cover is a small company symbol in the lower right hand corner. A card attached to the inside of the front cover contains the prospect's name and address, and some such explanatory note as: "Gas specifications for your new residence, 1013 West Second Street, Waukegan, Ill." This lends an added personal touch to the information which follows.

GETTING THE IDEA

Our idea for the Gas Specification Booklet came out of our own experiences with architects, builders or owners in trying to persuade them to specify proper and adequate gas piping in new structures. In going over blue prints of the various buildings we invariably found that specifications for building material, plumbing, heating, lighting fixtures, etc., were attached to them. It was evident that these specifications, covering the individual requirements of the buildings in question, were made use of by those in charge of the planning and construction. So we simply took a leaf out of the book of the building material firm, the plumbing and lighting fixture concerns, etc., in our decision to adopt the Gas Service Specification Plan. Previously we had relied upon our salesmen to furnish the information necessary to gas service, verbally and through leaving miscellaneous literature with interested parties; but while this more customary method brought some results, the returns from use of our Booklet are much superior to the former plan.

Under our present plan the local salesman makes a personal visit to architect, building contractor or owner, and gathers the necessary information on the individual requirements of the building about to be erected. During this call the salesman furnishes any of these parties with whatever information they desire on interior or exterior gas piping, or gas appliances.

Knowing the special requirements of the building, the salesman compiles the Gas Specification Booklet with these needs in mind, and delivers it direct to the architect, or building contractor, or owner. This gives him a second opportunity to go over the various appliances and piping which he is recommending as desirable for adequate gas service in the new structure.

CONTENTS OF BOOKLET

The Booklet's contents are multigraphed, company letterheads being used only for the first and last pages. The first sheet is a personal letter to the prospect, offering the gas company's assistance in the selection of efficient and economical appliances. Into the last page is inserted a stamped and addressed postcard to enable the prospect to make an appointment at his convenience with gas company salesmen. The company's phone number is also given on this page.

(Continued on Page 68)

Measurement Practice
Is Constantly Improving

¶ Oklahoma Natural Gas Corporation, with which the writer of this paper is identified, is one of the largest gas distributing and transmission enterprises in the Southwest, with headquarters at Tulsa. Experimentation in gas measurement and regulation on its extensive system has produced some interesting results, told of by Mr. Clark. His paper was originally given under the title "The Trend of Gas Measurement", before the Dallas session of the Natural Gas Association's Southwest Division.

By E. A. CLARK
Oklahoma Natural Gas Corp.

IN the presentation of this subject it is not my intention to go to England and start with Clegg, the first gas engineer, nor do I intend to dwell on the fact that George Washington in 1775 set aside by will a park in West Virginia to conserve that natural gas which was escaping from a burning spring. Nor is it necessary to tell how Fredonia, New York, was lighted with natural gas in honor of Marquis de LaFayette.

You probably all know that at one time every town and borough in Pennsylvania had an order and regulation prohibiting gas as a lighting and heating fuel. It was supposed to be the device of the devil's own creation and one of the agencies to be used on the last day in the consumption of the earth and the creatures thereon by fire. In 1873 Col. Nelson Faires drilled the first small gas well in the Mid-continent area near Iola, Kansas. It was not until 1888 that a large scale plant for the manufacturing of natural gas meters was organized by Calvin N. Payne at Erie, Pennsylvania.

The first annual meeting of the Natural Gas Association of America was held in Kansas City, June 12 and 13, 1906, and the second paper given was on "Gas Meters and Volume and Pressure Recording Gauges," by A. G. Holmes.

It was in 1911 that H. C. Cooper of the Hope Natural Gas Company began working on an orifice meter at the Wilkinsburgh measuring station. Walter Abbe and J. H. Satterwhite drew up a design for a differential and pressure gauge commonly known as the "Bombshell" type. This gauge, together with the coefficients developed at the Wilkinsburgh measuring station, were first used in an installation on the Hope Natural Gas Company's lines in West Virginia in November, 1911.

The first mercury type differential gauge was put on the market the latter part of 1912. Other types and designs of gauges followed these and a casual observer can see today we have materially progressed in the development of the mercury float differential gauges. This does not mean the positive displacement meters have not developed. Orifice meters are now generally used on large capacities, and the former on small deliveries.

E. A. Clark

Many papers have been written on meters and gas measurement; some dealing in the opinion that correct measurement of gas is just around the corner and others claiming that we know very little about it.

The object of this paper is not to enter into a discussion of topics which require careful study and long consideration by a committee, several of which are being so ably investigated by various associations. For instance, coefficients for orifice meters are being very well taken care of by the experimental work of the Natural Gas Association of America. This committee of the association has been working two years on coefficients, and the industry is looking forward to their conclusion with a great deal of interest. No doubt, with the aid of the Southwest Division of this Association, we will be able to do considerable work to help get the desired results. Suffice it to say that the tests so far make us appreciate more and more the original work of Mr. Weymouth and Mr. Hickstein and others before them.

I do not want to pass this opportunity to praise the Bureau of Standards and the Bureau of Mines who are doing such valuable research work and co-operating with this Association in their investigations on this subject.

A recent example of their work is the Bureau of Standards paper No. 320, written by H. S. Bean on "Gas Measuring Instruments." If you have not read this bulletin it will be well worth your time to do so. The Bureau of Mines at Bartlesville is especially active in the Mid-continent field, helping to improve conditions of gas measurement.

It is not necessary here to more than mention Temperature or Boyles Law, as there are several government bulletins available which give us detailed experimental results showing the correction and deviation. One other association is making a step forward by investigating and making comparative tests of different types of gravity apparatus. The Natural Gasoline Association should also be able in the near future to give us some very interesting comparisons on the several types of balances and bottles now on the market.

A few things have been accomplished in the last few years which have materially affected gas measurement and many causes of trouble have been eliminated. Many of these changes have had very little effect on the number of cubic feet, but have made more certain the trend toward better facilities and in many cases the elimination of doubt.

PHYSICAL APPEARANCE IMPORTANT

In the first place, the physical appearance of the equipment lends a great deal to the measurement of natural gas. Meters should be carefully installed, runs level, pens clean, charts neat, the equipment painted and on important installations possibly trimmed in some other color. Our company has at times been critcized for using so much paint and taking so much pains in seeing that the runs are level. The effect upon the public, the producer, and especially the company's employees far offsets the cost of painting and careful installation. The psychological effect of walking into a meter house such as referred to above must not be overlooked.

The operation and testing of meters can not be stressed too strongly, but it is not necessary to go into detail on the rapid advancement the companes are making in the care of their equipment inside as well as outside.

For domestic service many companies still use the tin meter, which was used so satisfactorily in the measurement of artificial gas prior to the rapid increase in natural gas consumption. The iron

case meter has increased in popularity from year to year. The use of the curb box meter is attracting considerable attention. In brief, the curb box meter cuts down the loss and unaccounted-for gas due to elimination of leaks in the service line from the curb to the residence; it terminates the company's liability at the curb; a more even temperature of gas is maintained and it reduces the necessity for re-reading because of inability to get to the meter. It absolutely eliminates stuffing box leaks and the loss of meters by fire.

Better methods and more convenient types of apparatus are gradually being developed and the men are taking more precaution in the operation of their meters, thanks to such valuable instruction as they receive from meter schools, meetings of the gas divisions and conservation schools of the utilities associations.

Too much time no doubt is often given to the correction of .1 or .2 of an inch variation in the differential of the orifice of the meter when more attention should be given to the pressure record.

On larger stations a mercury column may be installed and the pressure checked each day. The mercury column should be properly corrected for temperature. In this way a calibration of the pressure spring can be made whenever desired.

CARE OF THE ORIFICE METER

The time element in orifice meter measurement is another factor being watched closer than ever before. Not over two months ago I was told of a chart changer in charge of several orifice meters in the field who did not even carry a watch. Time on an orifice meter is as important as the pressure or differential. It is important to keep the discs of the orifice meter clean and sharp, especially on the cutting edges. Needless to say discs must be centered on the orifice flange. A deposit such as salt, which decreases the size of the orifice, increases the differential, but it is surprising what a small amount of deposit on the upstream side of the disc will cause the differential to decrease. A tallow candle rubbed around the cutting edge of the orifice will materially decrease the differential.

To eliminate dirt gathering upon orifice discs dust filters and scrubbers have been developed. In the last few years various types have been designed, but the ones which pass the gas through an oil bath seem to be the most popular.

Equipment in general is being improved rapidly and the manufacturers have realized that too much care cannot be placed upon the construction of the meter and recording gauges.

It is surprising to note that the paper from which charts are being made expands and contracts materially with the change of humidity. The meter manufacturers are taking care of this by making their charts out of paper which has the least amount of expansion with changes of humidity.

It is important that full information be placed upon the back of the chart before it leaves the field. Most companies have some form of station number which identifies the setting from which the chart came, and simplifies making the office records. Usually a printed form is stamped on the back of the chart which has a blank space for the station number, disc number, gauge number, the time of changing the chart and other information which may be of value to the chart clerk. In many cases it is advantageous to figure the charts in the field and check them in the general office. This gives quicker action upon a matter which is out of order and the deliveries from the wells can be better regulated to the desired percentage of the open-flow. In the calculation of charts there has been considerable improvement and curtailing of unnecessary work. It is only necessary here to mention such items as setting up of the chart which shows the number of hours in which gas is to be figured passing. We have found it good practice, without sacrificing accuracy, to figure coefficients, and use only one decimal place in the calculation of the delivery, one decimal point being used in the extension, three decimal points being used in gravity and the differential being figured to tenths of an inch up to 30 inches. Volume and pressure meter charts are figured on weighted average where it is necessary.

A little over five years ago our company started to use auxiliary control on the low pressure regulators. This has been rapidly followed up until at the present time most of the charts taken off of the domestic pressure regulators show almost a perfect circle. The Empire Companies under the jurisdiction of Mr. Hancock were pioneers in this work.

EFFECT OF PROPER REGULATION

Upon first thought you will probably wonder why I mentioned regulation in connection with gas measurement. We have found that correct regulation is one of the essentials in measuring gas properly. If the intermediate and domestic pressures are properly regulated the only variable you have in orifice meter measurement is the differential. The differential is then an effective measurement of the variation in the load. The intermediate and domestic pressures are kept at a point such that it is not necessary to have the usual fluctuations in load to build up a depleted line pressure and a decrease in the load to reduce excess in pressure. With proper regulation smaller discs can be used in the orifice meters, lower line pressure can be carried in the field as well as on the intermediate and domestic lines.

After the success on domestic pressure by the use of auxiliary control and improved supersensitive regulators, a study was started upon intermediate pressures. Tests were run upon different types of regulators and curves plotted showing the valve travel plotted against pressure in pounds. The test was run with a rising and falling stem. The difference in the two curves shows the fluctuation in pressure to open and close

(Continued on Page 66)

This Oklahoma Natural Gas Corporation station makes evident the value of keeping settings painted and planting a few flowers

The Revocable Permit *is* Proving Its Worth *in* Oklahoma

By E. F. McKAY
Manager, Oklahoma Utilities Association
Oklahoma City, Oklahoma

In the issue for June, 1925, WESTERN GAS published a discussion under the title "Advocating the Indeterminate Permit", by John A. Laing, vice-president and general attorney of the Portland Gas and Coke Company. This presented in considerable detail the basic theories back of the indeterminate or "revocable" permit, as it is sometimes called. Mr. McKay in his present article, tells how revocable permit legislation has been championed in Oklahoma, and how this type of franchise is working out in that State since its adoption in 1925.

THE Oklahoma revocable permit law so-called, known in other states as the terminable permit or indeterminate franchise law, is now generally regarded in Oklahoma as being in fact what its sponsors declared it to be when it was adopted in 1925, one of the most instructive acts ever written into the law, at least by the people of the State of Oklahoma.

After a year and a half of practical operation of the law the Oklahoma legislature refused to repeal the measure. While four bills were introduced in the Oklahoma legislature this year, two in the Senate and two in the House, having for their purpose the repeal of this much debated measure, all failed of passage. In fact, no one appeared before the committees having the proposed repeal measures in charge, in either house, to urge their adoption.

While the measure is still to be passed upon by the supreme court of Oklahoma in litigation brought to test its constitutionality, lawyers are practically unanimous in the opinion that the law conflicts with no provision of the Oklahoma Constitution and that it may be regarded as a permanent factor in the state of Oklahoma.

No legislative battle in the history of Oklahoma exceeded in bitterness that which attended the adoption of this measure in 1925. Following adjournment of the legislature in that year a determined effort was made by the enemies of the revocable permit law to defeat it through a referendum. But the sponsors of the measure, the public utility companies as organized in the Oklahoma Utilities Association, took up the gauntlet thrown down by the politicians who had failed to defeat the measure in the legislature, and the referendum failed for lack of a sufficient number of signers to the petitions which were circulated.

It was realized by friends of the measure at that time that efforts to repeal this law would be made in 1927 and that unless the law could popularize itself in the meantime such efforts were likely to succeed. Throughout the interim an educational campaign was conducted in the name and under the direction of the Oklahoma Utilities Association to the end that the public should be made acquainted with the benefits of this law if the same should be recorded. How successful this campaign of education was is best indicated by the failure of the efforts of those who sought to accomplish the law's repeal.

SUBSTANCE OF THE MEASURE

This law provides, in substance, that any utility furnishing power, light, heat, gas, electricity or water under a municipal franchise may at any time before expiration of such franchise surrender the same and receive from the state a permit preserving all terms and conditions of the surrendered franchise except as to its period of duration, such permit being revocable by the state legislature for cause.

All rights of a municipality under a franchise are specifically preserved in this law, including, if in the franchise, the right to purchase the property of the utility.

No utility has any rights under the revocable permit law *unless it holds a municipal franchise.*

That citizens still have and exercise the right to decide for themselves what utilities shall serve them is demonstrated by the granting of 135 municipal franchises in Oklahoma since the revocable permit law was introduced in 1925, which is more than four times as many as those recorded in any other equal period of time since statehood.

More than three-score Oklahoma cities and towns have secured electric service and more than twenty gas service, which had no such service prior to the meeting of the 1925 legislature and the passage of the revocable permit measure. Many cities and towns previously having partial electric service have secured 24-hour service under the revocable permit law.

About one hundred and fifty Oklahoma cities and towns supplied by private utility companies now have lower light rates, nearly as many have lower power rates and several have lower gas rates than before the revocable permit law was adopted.

No Oklahoma town supplied by a public utility company has had an increase in electric rates during this time. The only Oklahoma town to have had electric rates increased since this law was adopted has municipal ownership of its electric plant and distributing system. This town is Miami.

The annual saving to customers through electric rate decreases announced since this law was passed is approximately $350,000. The number of consumers who have benefited by these rate decreases is approximately 95,000.

Since the revocable permit bill was introduced, more than 2,000 miles of electric transmission lines have been constructed in Oklahoma, 1,400 miles in 1926 and 1927. This is an increase in mileage since January 1, 1925, of about 85 per cent.

GAS LINES EXTENDED

Gas transportation trunk lines in Oklahoma, four inches or over in diameter, laid since the revocable permit law was adopted, exceed 600 miles, at least 50 per cent of this mileage being eight-inch or larger.

This expansion of pipe lines and transmission lines under the revocable permit law represents nearly $20,000,000 of new capital attracted to Oklahome for investment. Electric lines constructed during this period have cost $12,000,000 and gas pipe lines approximately $8,000,000.

New capital for investment by electric utility companies in 1927 is $10,050,000, while gas company expenditures for 1927, already scheduled, will exceed $12,000,000.

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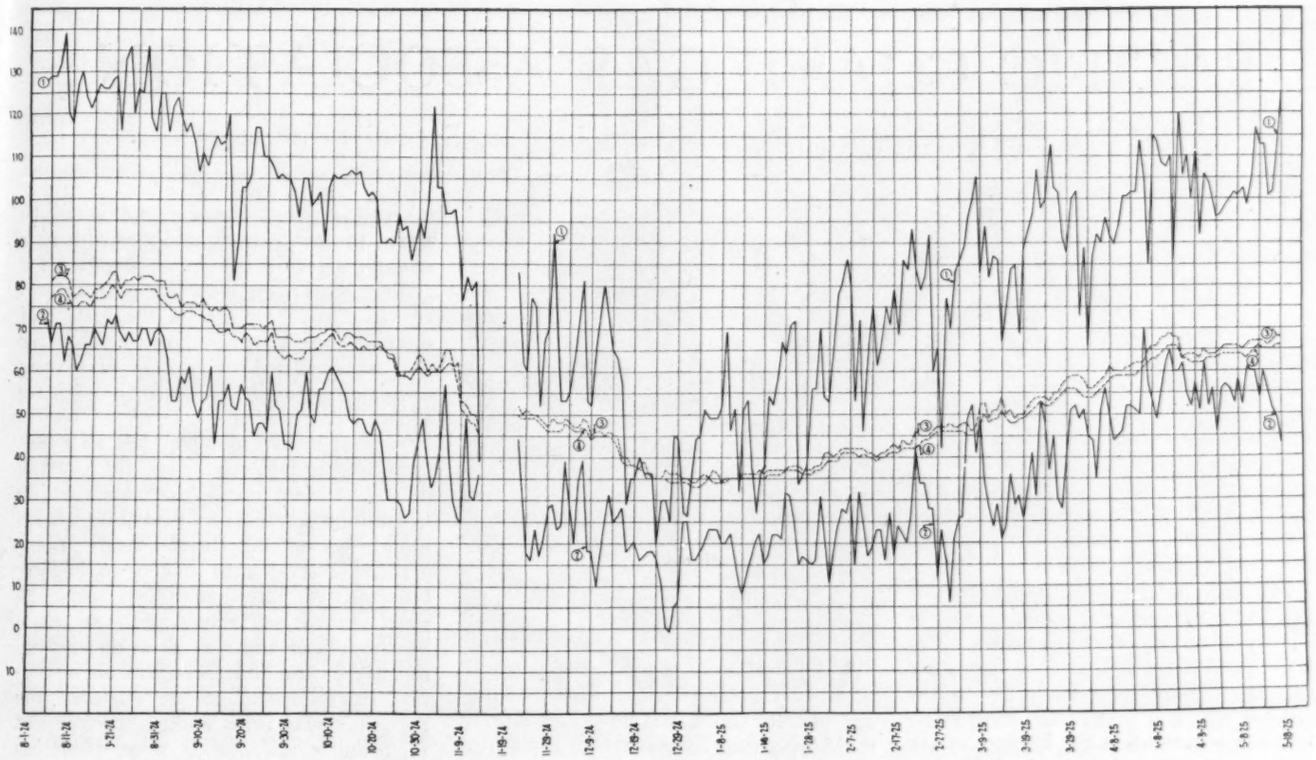


Figure 1, above, illustrates daily temperature variations of flowing gas in covered and uncovered pipe lines. The vertical scale is for temperature, in degrees F; the horizontal is for date. Following is the legend for the curves: (1) Maximum daily temperatures of gas flowing in a 3-inch uncovered line. (2) Minimum daily temperatures of gas flowing in a 3-inch uncovered line. (3) Maximum daily temperatures of gas flowing in a 6-inch line covered to depth of 18 inches. (4) Minimum daily temperatures of gas flowing in a 6-inch line covered to depth of 18 inches.

Temperature Fluctuations *of* Natural Gas *in* Buried *and* Uncovered Pipe Lines

By E. L. RAWLINS
Associate Natural Gas Engineer
U. S. Bureau of Mines

ACCORDING to Mr. Rawlins, who prepared the Bureau of Mines report published on this page, the investigation covered by the report was originally begun as a minor part of the main problem of research on leakage losses from high pressure transmission lines. Its primary object was merely to establish the magnitude of temperature fluctuations under different conditions. However, the results of this first investigation have led the Bureau to enter upon another inquiry in a related field—to determine if possible an economic depth to which a pipe line should be buried to minimize temperature fluctuations. For ten months of a planned twelve-month period ground temperatures have been recorded at various depths, and in the near future another Bureau report will be issued covering this phase of the investigation.

PIPE lines through which natural gas is flowing should be buried in order to minimize fluctuations in the temperature of the gas, as these fluctuations have several harmful effects.

One of these effects is to decrease the accuracy of measurements of gas volume. In order to meter properly the quantity of gas flowing past any point in a transmission system, it is necessary to know the temperature of the gas. If the temperature remains fairly constant, the gas flow can be measured with a close degree of accuracy, but if it fluctuates rapidly, close measurement is impossible.

The accuracy of volumetric measurement is greatest when the temperature of the gas is nearest to the standard temperature of 60°F. This is due to the necessity of applying a correction to the apparent volume of gas as measured at other temperatures, in order to determine the true volume at 60 degrees. There is usually more or less error introduced in making such corrections, and this error is greater the larger the correction.

A second and very important effect of fluctuation in temperature has been observed, when the leakage of gas from transmission lines constructed on top of the ground was compared with that from lines covered with earth. The rapid temperature fluctuations, when the lines are exposed to the rays of the sun, cause expansion and contraction in the joints and increase the leakage of gas. This effect has been more noticeable in lines with screwed and rubber-coupled joints than in welded lines.

In order to estimate the magnitude of these temperature fluctuations, records were kept for a period of one year of the temperatures of natural gas flowing in buried and uncovered pipe lines. It is hoped that these records will serve as a basis for explaining differences in leakage rates from buried and uncovered transmission lines, "breathing losses" in gasoline pipe lines, and apparent errors in natural-gas measurements.

(Continued on Page 64)

PACIFIC COAST GAS ASSOCIATION

A Department Conducted by Clifford Johnstone, Executive Secretary

Read This and Get Busy!

THE members of the Pacific Coast Gas Association who hear the gavel tap which opens the thirty-fourth Annual Convention in Santa Cruz on September twelfth are assured of a program which will eclipse anything ever before attempted by the Association. It will be a program designed to prove that gas is the most perfect fuel known to mankind and prove it in such an inspiring manner that each member will return home imbued with the faith and enthusiasm which know no defeat.

The section chairmen are proud of their program and wish to make it even more vital and potent by endowing it with a personality. To this end they are offering a prize of ten dollars to the member who can present the most striking phrase to serve as the keynote of the convention. There is no restriction on the number of suggestions submitted by a member and all suggestions should be sent the secretary not later than July 20th.

It is not necessary to know the details of the program for it will be typical of the gas industry—a great and growing industry built on the fundamental idea of rendering a vital and indispensable service. Gas was the pioneer in lifting the burden of drudgery from the shoulders of the housewife just as it is now decreasing labor and improving the product in thousands of factories. It is the one fuel which meets all the requirements of close temperature regulation, ease of control, cleanliness, efficiency and conservation of natural resources. It is scientific in its origin and carefree in its utilization. Its use is increasing and its cost is decreasing and many of its most wonderful possibilities are just appearing on the horizon. Gas is worthy of the faith of gasmen and worthy of a faith that will inspire an enthusiasm ever-increasing in fervor and intensity.

Have Pacific Coast Gasmen been inoculated with this enthusiasm? We want to find out. Send your suggestions for a convention keynote to the Secretary, 447 Sutter Street, San Francisco, before July 20th. And make them short. Ten words is about the limit, five words is better.

Stunt's Night

The various companies are climbing on the bandwagon to win the trophy offered by Addison B. Day for the best Public Relations stunt to be presented to the Convention audience on Thursday evening of Convention week.

There are ideal stage facilities at the Casino at Santa Cruz to put over almost any kind of a stunt. Scenery and cast need not be elaborate, although there is no objection to going "as far as you like."

Get your committee to work at once and go in to win! Send information in regard to your entry to D. L. Scott, care of Los Angeles Gas and Electric Corporation, Box 1100 Station C. Los Angeles, California.

Send In Your Advertising

ALL member companies of the P. C. G. A., whether utilities or not, are invited and urged to contribute to the Advertising Exhibit which is planned for the Convention.

Advertising in the Exhibit will be grouped in the following classes: Newspaper and Magazine—Commercial, Financial, Institutional; Direct—Commercial, Financial, Institutional; Signs—Window Display, Billboard, etc., submitted in the form of photographs; House Organs and Year Books

Wherever possible white, coated stock should be used.

It is earnestly requested that member companies begin sending in samples of these various kinds of advertising AT ONCE so that the committee in charge of the Exhibit will have ample time to arrange the display.

All advertising matter submitted should be forwarded to E. P. Ramsay, Advertising Agent, Los Angeles Gas and Electric Corporation, 810 So. Flower St., Los Angeles, California, or if by mail, Box 1100, Station C, Los Angeles, California.

It is hoped that all member companies will cooperate as much as possible in making this exhibit a success.

Improve Gas Appliance Installation Methods!

THERE is plenty of evidence to support the conclusion that one of the principal causes of antagonism to the use of gas on the part of the housewife lies in the sloppy installation work done by dealers in even the best of equipment. With women especially first impressions have a great deal to do with moulding final judgment and it takes a mighty fine gas appliance to attain the enthusiastic endorsement of a woman after it has been installed by a dirty workman, who has gotten mud on the floor, graphite on the wall and scratched the furniture, and which after that has required two weeks of frantic telephoning to finally place in working order.

A good sized order was lost to a San Francisco firm not long ago because the man who went out to estimate the job had a long screwdriver protruding from his hip pocket and thereby made an ineradicable scratch in a new mahogany bedstead. A club woman two years ago purchased a gas range with an oven heat regulator and was given no instructions in its use and there was no inspection or follow-up to see whether the regulator was functioning. It was not functioning and she is now using an electric range, as are all other members of her club who have had occasion to purchase a range since she talked about it. An appliance firm has one man taking care of service work. He is sometimes three and four days behind in his calls. Another firm is attempting to install and service appliances in one city with an organization located in a nighboring city. Three weeks delay in an installation and ten days on a service call is nothing out of the ordinary. A salesman told his customer that the operating cost of a certain installation would run $30.00 per month. It actually cost $70.00 per month.

It is unnecessary to relate other instances. All of us who have had contact with the gas appliance situation know of undersized installations sold on a price basis, of faulty vent connections, and of other crimes against the use of the most perfect fuel known to mankind. If these delinquencies hurt only the firms concerned, we might let it go, calling their failure only a just retribution. But unfortunately they hurt every one in the gas business, including the gas company.

The obvious answer of course is more care and a more thorough education of personnel, but perhaps a quicker and more practical solution is the inauguration of a follow-up inspection system of all installations. Dealers are now free to police their own installations, but if they do not and will not, the gas company for its own protection must either do it for them or urge the municipality to install a permit and inspection system.

Walter C. Coakley

IT was with great sadness that friends of Walter C. Coakley, general superintendent of the Spokane Gas and Fuel Company and a member of the Pacific Coast Gas Association for the past five years, learned of his instant death on May 26th, from a steam explosion which occurred at the Spokane plant.

From M. W. Thernes, secretary of the Spokane company, we have the following summary of Mr. Coakley's career in the gas industry:

"Mr. Coakley started with the Doherty organization when Mr. Doherty acquired the Toledo Gas Light and Coke Company. Mr. Coakley was identified with the gas business for about thirty-five years and as a boy he operated the first water gas machine installed by the United Gas Improvement Company. From Toledo, he was transferred to Tonawanda, New York, as General Superintendent and from Tonawanda, he was transferred to Knoxville, Tennessee. In September, 1921, he was transferred from Knoxville to Spokane as General Superintendent. In Spokane, Mr. Coakley made an enviable record. He is remembered as a 'man's man' by all who knew him there."

H. H. Ranlett, Los Angeles Gas & Electric Corporation, has been appointed by Mr. Simmons as chairman of the Credits and Collection Committee on account of resignation of A. R. Foster.

This picture of Walter C. Coakley was taken eight days before his fatal accident in Spokane

Big Tree Drive, near Santa Cruz, California

Something About Santa Cruz—1927 Convention Site

PERHAPS no other one of California's resort-playgrounds can so easily be reached from all parts of the Pacific Coast as can Santa Cruz. From San Francisco or Oakland it is an easy three-hour drive—all the way on paved highways, amid scenes of unrivaled beauty. Santa Cruz is also easily reached from Fresno, Merced, Modesto, Stockton and other valley points. Both the Pacheco and Chittenden passes are in excellent shape and provide a connected route from middle and southern valley points. Leaving the state highway at Salinas, motorists from the South can drive through the beautiful Jajaro Valley, via Watsonville, to Santa Cruz, a distance of only forty miles.

Santa Cruz is now one of California's leading all-year resorts. "There Is Something to Do—the Year 'Round—at Santa Cruz" is the new Santa Cruz slogan. Bathing in the exhilarating surf, where there is absolutely no dangerous undertow, and in the marvelous Casino Natatorium are perhaps the most popular forms of recreation. The Santa Cruz golf links, known far and wide as one of the sportiest 18-hole courses in the state, is another leading attraction. Three of the finest tennis courts in the state, featuring the new Yaykold process of paving, have recently been installed.

The bay is teeming with speed boats, trailing surfboard and aquaplane riders, with yachts and other vessels. Deep-sea fishing rivals fresh water in interest here.

Last, but far from least, is the marvelous scenic setting in which Santa Cruz is placed. Located at the edge of Monterey Bay with a splendid bathing beach, Santa Cruz is only a few miles from some of the most wonderful mountain scenery on the coast. The Santa Cruz grove of Big Trees (Sequoia Sempervirens) is only six miles from the beach. These trees are not only among the largest in the world, but are also said to be the oldest living things in existence, their ages being estimated at between five and six thousand years. California State Redwood Park, otherwise known as Big Basin, is twenty-six miles from Santa Cruz.

Fifty Dollars for Best Convention Offering

We hope that the three hundred or so members who have contributed to the program of the Santa Cruz Convention have not forgotten that President Willis Yard has posted fifty dollars with the Awards Committee with instructions that it be given to the author or authors of the paper or report receiving the highest marking. Our president has also contributed fifty dollars for the purchase of a prize for the member who makes the lowest gross score in the men's golf tournament. Thus skill in work and play are to be equally rewarded.

EDITORIAL

Blazing More Trails for Gas

CONSIDERABLE space in this issue of *Western Gas* is given over to new gas transmission line projects, of which there are many of present interest in Western America.

There is always lots of satisfaction to be had from the laying of a gas line, because of what it means in future development. If we could project our imaginations over the next ten years, what industrial strides would be seen in these sections to which gas is being brought! And what a measurable gain in home comfort would be noted, in the spread of house heating by gas, made possible in many cases by the readjustment of rate structures following introduction of new natural gas supplies.

That these transmission enterprises mean conservation through effective utilization of an invaluable resource is more cause for satisfaction.

Very evident in connection with the laying of these large gas lines is the fact that increased utilization of gas, in industry and in the home, *must* follow, if the tremendous cost of the construction is to be paid out. This is where the gas salesman comes into the picture. His work must accompany that of the engineer, providing the outlet for added deliveries of gas fuel. Sales work, in fact, usually precedes large transmission enterprises. In many cases the salesman's work will be simplified, in the communities where manufactured gas is being supplemented with supplies of natural gas, and lower rates will introduce a telling element in his selling.

Too Good An Opportunity to Be Overlooked

GAS companies are overlooking a bet when they fail to line up in the work of their community promotion organizations such as chambers of commerce, boards of trade, community advertising bodies, and the like. These groups offer many legitimate opportunities for directing favorable attention to the product the gas company is merchandising.

Industrial advertising, now entered into by a number of leading cities, illustrates what we have in mind. Good gas service is an industrial argument which bears heavy weight with a manufacturer who is considering locating in a community. Both manufactured and natural gas can support their claim to being industrial assets of first importance, along with such factors as labor, power, climate, transportation and market facilities.

Gas companies will do well to make sure that their community booster organizations are aware of what they have to offer in gas service, and that gas is playing a part in the community message directed at new manufacturers. Not only does this kind of publicity show immediate returns in new factories and an enlarged community, but it gets gas favorably before community leaders and in many cases before the community generally.

Boost the A. G. A. Laboratory Program!

IT is time that individual gas companies give some special thought to how they are going to tie in their efforts to support the American Gas Association Testing Laboratory. A. G. A. headquarters cannot supply all the initiative, and, what is equally true, only the individual gas company can know the special demands of its field.

The gas industry, which is financing the Laboratory and counting heavily upon it to clear up certain troublesome phases of the appliance situation, will naturally welcome the day when its findings cover the whole list of gas-burning appliances. This will require time, for the Laboratory is not doing its job by half-way measures. In the meantime, gas companies can get behind the appliances which have approval in the limited field of the tests made to date. One hundred and twenty-five companies have already pledged themselves to sell only Laboratory-approved appliances; other companies which do not merchandise appliances have done some effective work towards getting the Laboratory before the public in their local advertising, thus beginning the task of influencing dealers to push Laboratory-approved lines.

Open Season for Conventions

AS inescapable as the seasons, Convention Time is putting forth its preliminary signs, appealing again to the attention of the gas man. No one would want to escape Convention Time. Too many pleasant, as well as valuable associations are linked up with memories of past conventions.

Attendances should shatter some past records this year. The Pacific Coast Gas Association convenes in Santa Cruz, a mid-point for Coast travel. Chicago, the American Gas Association's 1927 convention site, is accessible to all the nation.

Southern California *is the* Land *of* "Shut-offs *and* Turn-ons"

By OSCAR L. MOORE
Manager, Customers Department, Los Angeles Gas and Electric Corp.

Second only to the realty operators, the boys who "carry your grip" are the busiest crowd in Southern California. Back east folks lived in one house for generations; or if not, they don't think of moving until about the first of May of each year. But not so in Southern California; every day is moving day here.

WHY THEY MOVE

With the growing community the residents are approached to sell their homes, and tempted by a substantial financial gain they submit, so out they go and in comes the new owner. Now the old owner must live somewhere, so we find him moving into some other person's home until he can rebuild for himself.

The tourist of whom we hear so much comes for a temporary stay with us. It is his custom when visiting other cities for a short time to stop at a hotel. However, when he comes to Southern California he finds available cozy aparments or bungalows fully equipped for light housekeeping. These induce him, or perhaps more correctly Mrs. Tourist, to live under a family roof, and make a change of occupant both when he comes in and a short time later when he departs.

Our own permanent residents are called by the vacation land to go either to the seashore or mountians for a short stay and very often so great is the usual demand for houses that they have no trouble in renting their homes to folks who wish to stay in town a short time.

With the growth of the city commercial and industrial districts are continually expanding, crowding the residential districts farther and farther away from the center of the city.

So there are, as can be seen, many reasons why the transfer man and the moving van are abroad in our land.

MOVING AFFECTS GAS COMPANY

Every one of the many moves made by the residents of Southern California throws a burden upon the gas utility, in addition to the regular duties of supplying gas for heating, cooking, etc., assumed by it.

Systems of keeping customers records and accounts which have proven satisfactory and economical in other districts are not possible here. In some of the old established communities of the East and Middle West gas ledgers are are laid out to cover a period of many years. Some have fly leaves upon which are entered the names and addresses and other fixed information concerning the customer, which is virtually never changed. In these books sheets are inserted for the readings, consumption, etc. The use of such books would be out of the question here. In fact, we are more often limited for space in which to enter the changes of names than we are for space for readings, etc.

Oscar L. Moore

Methods followed for keeping customer records and accounts in other sections of the country will not answer in Southern California, says Mr. Moore, and he goes on to explain just why his territory has troubles all its own. Moving day comes often among Los Angeles Gas & Electric Corporation's consumers, making the task of recording and collecting extraordinarily difficult. For one average month the closing reads and turn-on orders amounted to 12 per cent of all the gas meters in circuit in the company's Los Angeles district.

READING COSTS

Reading costs are higher with us on account of the many special opening and closing reads occasioned by the changes of occupants. To illustrate more clearly the extra burden placed upon the gas utility, we quote here the number of closing reads and turn-on orders executed in an average month:

Meters closed,	14,798
Meters left turned on for New Occupant	2,355
Meters turned on or found on upon order of New Occupant	15,313
	32,466

or 12% of our total gas meters in circuit in Los Angeles District.

COLLECTIONS

Collections are difficult for several reasons. Some customers enter premises already supplied and pay regular monthly gas bills under the name of the old occupants. When moving out the closing account is, therefore, not in the name of the proper debtor, and hence collection is difficult if not entirely impossible.

With a high percentage of folks continually coming and going, many depart failing to order a closing read and not leaving a forwarding address. These accounts of lost debtors are nearly impossible of collection. Deposits for establishing credit save some of the loss, but regulations do not permit of a deposit of sufficient size to insure absolute protection.

KEEPING CUSTOMERS ACCOUNTS

In addition to the necessity of providing more expensive records for customers accounts, as referred to above the cost of their keeping is increased on account of the percentage of changes being so great. This portion of our work is also fraught with many chances for error, wherein bill are renderd in the wrong names, etc.

THE UTILITY'S JOB

It can thus be seen that moving day brings its grief to the utility, and when such moving represents over one thousand customers each day, or at the rate of one move for each customer every eight and one half months, the grief is of considerable proportion.

MANUAL ON RATES

A manual on "Better Forms of Rates for Gas" has been prepared by the American Gas Association committee on rate fundamentals, with the assistance of C. S. Reed, rate consultant at A. G. A. headquarters.

GAS HELPS CAN FIRM TO MAKE BILLION CANS A YEAR

One of the industrial consumers of the Pacific Gas and Electric Company is the American Can Company, which has five factories in P. G. and E. territory, with a total yearly production of a billion cans. Gas is used in solder baths, melting pots, drying ovens, etc., the yearly demand coming to about 66,000,000 cubic feet.

Pressure Regulation *in* Transmitting Large Quantities *of* Gas

By A. J. KERR
Pittsburgh Equitable Meter Company
Tulsa, Oklahoma

THE purpose of this paper is to give a general outline of some of the most important points covering the maintenance and operating characteristics of high and low pressure regulators.

Pressures are controlled by a number of different systems. The most important must be automatic in action. Numerous devices have been designed to perform this service and all can be classed under the general heading of *regulators*. According to L. S. Lichty in his book "Natural Gas," "The duty of a gas regulator is to take gas as it is delivered to it at any pressure, reduce the pressure to that pressure desired, within very close limits." In a gas system, well pressures and suitable pressures for efficient transportation in pipe lines must be reduced to a lower point for economical and safe utilization.

IN THE OLD DAYS

In the early gas fields of Pennsylvania, pipe lines were run to houses and communities with very little thought given to the value or to efficient use of the gas piped. It was burned, ordinarily, in an open grate or coal stove without proper burners. We are thankful for the rapid development of this wonderful fuel because most of us are dependent upon it in some way or other. This development was facilitated greatly by the cooperation of the appliance manufacturer and the gas man and each one is indebted to the other.

Due to the familiar laws of pipe line leakage, it is very essential that all pressure be maintained at a minimum, of course, guarding against the possibility of an insufficient quantity at the point of consumption. This minimum allowable pressure is established by the character of the carrying system and the quantity to be transported. It is economy to keep the controlled pressure near to the minimum without going below. When loads are variable this is very difficult to accomplish and regulator manufacturers are being called upon to control pressures within very close limits.

To analyze the various problems of regulation, we might first consider the various types of large size regulators which have balanced valves. They are divided into three types: *Special High Pressure, Standard High Pressure* and *Low Pressure Supersensitive*. We can then analyze each as follows:

Special H. P. Regulators are designed to take inlet pressures as high as 2,000 pounds per square inch. This range of pressure under present systems of pipe line construction must be reduced to some safe line pressure. The greatest difficulty encountered is the cutting of valves and valve seats, due to the extremely high gas velocity and the foreign solid matter carried by the gas. To overcome this we use case hardened metal for both valves and valve seats. Difficulties of freezing are serious and will be discussed later.

Standard H. P. Regulators are designed to take inlet pressures up to 600 pounds and reduce them down to some lower point. It is, of course, to be understood that a 600 pound pressure cannot satisfactorily be reduced to a very low pressure in one regulator. Such a reduction should be made in two or more steps. Sometimes dissatisfaction is experienced when regulator companies give an allowable inlet pressure of 600 pounds and a low outlet pressure. This nomenclature on the regulator merely states that the body of the regulator will withstand a pressure of 600 pounds.

Most regulators are designed to control the pressure within satisfactory limits. These limits are sufficiently close for the majority of services. Some few requirements necessitate very accurate control.

I have been called upon to explain various difficulties encountered when regulating gas pressure and a short discussion of various points may be of interest.

PROBLEMS OF PRESSURE REGULATION

Freezing: The tendency of a regulator to freeze is due to the ratio of inlet to outlet pressures, the character of the gas and the design of the regulator. The law of expanding gas states that it absorbs heat very rapidly at the point of expansion. If heat is not available, the temperature of the expanded gas becomes very low. The low temperature is due to the ratio of inlet to outlet pressure and if this ratio is large a low temperature is the result and some constituents of the gas solidify. It is apparent, then, that the character of the gas determines largely whether or not ice will be formed to interfere with the regulator operation. If the gas carries free water, the reduction in pressure must be low, as the water will solidify as soon as the temperature reaches a point below 32 degrees F. On the other hand, very dry gas, when at high pressures and reduced or expanded to low pressure, will cause a temperature far below zero and will solidify some of the natural constituents of the gas. Taking a typical example, we may have gas at 300 pounds saturated with water. After the gas is expanded its water carrying capacity is greatly increased and water would be absorbed by the gas at the low pressure. Even in this case, however, such a low temperature is formed right at the valves that ice is formed. This one place will ordinarily interfere with proper operation of the regulator. To overcome some of this trouble we have found it good policy to have the valve guides removed as far as possible from the actual valve seat. Ice then formed at the valves does not interfere with the valve guides.

In some cases where gas carries a large percentage of water or where ratio of inlet to outlet pressure is large, it is economy and almost a necessity to install some sort of heater on the lines very close to the inlet of the regulator. This ordinarily remedies the freezing trouble.

Internal Friction: It is very essential that all friction be eliminated from regulator parts, so that the valves will be free to move with the slightest variation in outlet pressure. If there is undue friction the regulator will open or close by jumps. This gives a very irregular pressure curve and each sudden change in pressure gives a very large change in volume of gas. This is very serious when the gas is measured immediately below the regulator. A good test for friction is to move the lever by hand to some new position and see whether or not it returns to its original position. If it returns near to its original position, there is very little friction. If, however, some of the parts are binding or sticking, the lever will stay in the new position.

Dirt: A few years ago the biggest dirt troubles were experienced in new lines where it was common to find rabbits, stones, sticks and all kinds of things

jammed in the regulator valves. Such troubles were only temporary and a few cleanings removed all trouble. Now since some gas being transported oxidizes the interior of the pipe lines, great quantities of dust accumulate in regulators as well as in other equipment. A regulator will not operate properly when the valves and body are jammed full of this dirt. This trouble has made a demand for a regulator which can be cleaned and serviced easily and quickly, without removing it from the line. Also this dust constantly passing through the valves cuts them badly. To meet this condition, seats should be renewable and valves made adjustable.

Tight Shut-off: Hard seat regulators can be ground so that valves do not leak, yet the first shot of gas will leave a deposit on the seats sufficient to make the valves leak. From a manufacturer's point of view this is rather hard to explain, as some field men claim that a new regulator should shut off tight. On some service it is very necessary that the regulator shut off tight. This is particularly true in border reducing stations for small towns. To accomplish this, we have been furnishing, for inlet pressures up to 75 pounds, regulators with raised seats and with valves equipped with paranite discs. The paranite discs stand up very well under dirty gas condition and they allow a very positive shut-off, even if a certain amount of dirt is present.

Effect of Varying Loads: The inlet pressure remaining constant, it might be interesting to discuss the reason for the slight variations in outlet pressure due to change of load. The diaphragm of a regulator is one of its most important parts and the most practical for all service is one made of rubber or composition. In testing the characteristics of a diaphragm, we have found that a certain pressure will balance a given weight at one point only. To analyze this we can take a typical diaphragm and place a weight of 500 pounds on top of it and put gas pressure underneath. By increasing the gas pressure it is found that the diaphragms will lift the weight gradually as the pressure underneath is increased. To get to practical conditions, we can say that if there is an allowable travel of one inch, that the diaphragm will start to lift the weight at 35 pounds pressure. Then as the pressure is increased, the diaphragm will rise and at 40 pounds the diaphragm will have traveled upward one inch. Picturing this condition in a regulator, we would have the 500 pound weights applied to the diaphragm directly or by a system of levers and weights. With no pressure under the diaphragm the weights would hold the valves open, then 35 pounds under the diaphragm would just be sufficient to balance the weights. In order to close the valves under these conditions, it would be necessary to increase the pressure to 40 pounds. This all proves that the effective area of the diaphragm changes considerably with different positions. Now considering this change in effective area in reference to the actual operation of a regulator, we can assume a constant inlet pressure of 100 pounds. We would place the 500 pounds of weight on the diaphragm and would naturally find that the outlet pressure would rise to 40 pounds where valves would close. If the requirements for gas came on the outlet, pressure would fall to 37.5 pounds assuming that a valve opening of one-half inch would pass sufficient quantity of gas. This shows the characteristic rise and fall of outlet pressure with corresponding rise and fall in demand.

IN ANALYZING the problems of regulating pressures of large quantities of gas the author of this paper, which was delivered at the 1927 Southwestern Gas Meter Short Course at the University of Oklahoma, discusses each of the three types of large size regulators which have balanced valves — the special high pressure, standard high pressure, and low pressure supersensitive types.

The paper also briefly treats such difficulties encountered in pressure regulation such as freezing of regulators, internal friction of regulator parts, the problem of dirt in lines, getting tight shut-off in the face of dirty gas condition, variation of outlet pressure with changes in load, and the effect of varying inlet pressures.

Mr. Kerr predicts that the future of gas regulator manufacture will bring many refinements, in the direction of completely automatic operation. He expresses the opinion that, in view of the close relation between gas regulation and gas measurement, these two phases of operation should be closely associated in the organization of the gas company personnel.

Effect of Varying Inlet Pressure: To analyze the effect of inlet pressure, we again call your attention to the pressure which will balance a certain weight at a certain position. If the load or demand remains constant, the valves must open farther when the inlet pressure falls and must close when the inlet pressure rises. For the valves to rise and fall it is necessary for the outlet pressure to change, to offset the change in effective area of the diaphragm.

A theoretically perfect gas regulator would always give a definite outlet pressure for a certain weight placed on the diaphragm. If we would replace the diaphragm by a frictionless piston and cylinder having a constant area, we would get this perfect regulation. Such a design, of course, is not practical.

I am hoping that the explanations above will give a definite idea why a regulator, when set at a certain outlet pressure, will change with both inlet pressure and quantity of gas required to pass through it. This change in outlet pressure, however, is not objectionable in the majority of cases.

Perfect Regulation: We can define perfect regulation more clearly now by stating that it is perfect only when the outlet pressure does not vary at all with changes in inlet pressure or changes in volume. A recording gauge on the outlet of a perfect regulator would show a smooth circle with no variations. Such regulation is not a necessity in very many installations but should be of general interest here. Such regulation has been achieved, where, on an Emco regulator, the variation in outlet pressure is one-fourth of one pound at a pressure of 40 pounds. Some description of this installation will no doubt be of interest.

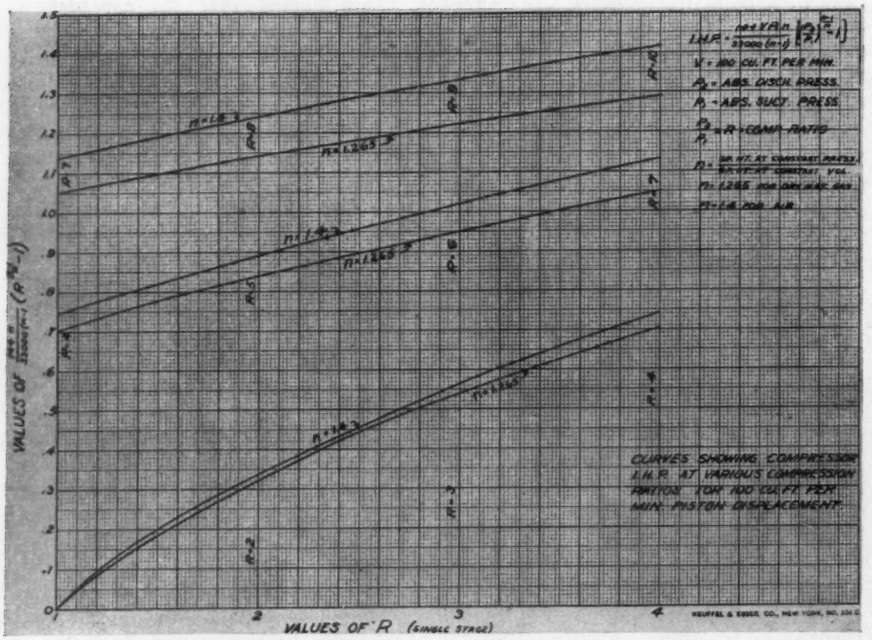
We have talked above about the change in effective area of the diaphragm and for our comparisons we may state that on a 7-inch diaphragm the area changes from 10 square inches to 11 square inches for the required valve travel. Reducing this to any standard regulator conditions, we could expect, at 40 pounds, a variation of 3.63 pounds. At 80 pounds we would get a similar variation of 7.26 pounds and the variation would increase as the inlet pressure increased.

From this it can be seen that, at a pressure of 2 pounds on outlet of regulator, the variation would be well within the limits of one-fourth pound. To get this action, it is merely necessary to replace the weights on top of the diaphragm by gas pressure. This gas pressure forms more or less of a balanced condition making the effect of the diaphragm the same as at the 2-pound pressure, the 2-pound pressure being sufficient to lift the weight of the valves and diaphragm parts. To further analyze this condition at a high pressure, of say 50 pounds, we could maintain very accurately a pressure of 50 pounds on top of the diaphragm then the pressure under, which is the regulator's outlet pressure would only vary from 38 to 38¼ for full valve travel.

To maintain this constant pressure on top of the diaphragm, we used for our test a commonly known oxygen regulator and allowed a small amount of gas to escape. The inlet of the small regulator was taken from the inlet of the large regulator. This balance pressure can be maintained very accurately in this way because of the constant small volume passing through it.

On the particular installation where this was tried out, a 12-inch Emco H P

(Continued on Page 70)


VALUES OF R (SINGLE STAGE)
CURVES SHOWING COMPRESSION I.H.P. AT VARIOUS COMPRESSION RATIOS FOR 100 CU. FT. PER MIN. PISTON DISPLACEMENT.

Gas Engines, Compressors

PART II.

of a discussion presented before the members of the California Natural Gasoline Association. Part I appeared in the June issue of WESTERN GAS. *"Supplementary Sheet A," referred to by the author of this paper, is shown on the left, and below is "Supplementary Sheet B," showing an alignment chart also referred to in this concluding installment of Mr. Reed's paper.*

By J. W. REED

IN DESIGNING and building compressor cylinders for use in natural gas compression work, the manufacturer is called upon to meet many conditions. The pressure of the gas from the wells is apt to vary widely in different locations or from different wells in the same location. The final discharge pressure to be carried at the plant may be anything from 10 pounds to 1500 pounds or even higher, and the specific gravity and specific heats of the gas to be handled will also vary sufficiently to further complicate the problem.

Trade practice in the gas business also now demands that the manufacturer place a definite guarantee on his compressor as to the actual amount of free gas it will deliver under the specified conditions, instead of his simply selling a cylinder of certain dimensions with a stated piston displacement as was formerly done and still is customary in the case of small air compressors.

It is obviously impossible for any manufacturer to have accurate shop test data on each and every size of compressor built under all of the many combinations of pressure conditions and with the different kinds of gas to be found in different parts of the country. He must therefore rely almost entirely on formulae based on sound theory when calculating the size of compressor necessary to meet certain requirements. These formulae, as mentioned above, are basic and universally accepted, but unfortunately their use and application permits the arbitrary assumption or designation of values to certain quantities by the designer. This fact accounts for the sometimes considerable difference in the guarantees of one manufacturer as compared to another. Since practically all of the various plate valve compressors on the market are almost identical in construction and operation, they should all be considered on the same basis as far as the question of *horsepower per unit of actual capacity is concerned.* One exception to this might be a compressor with insufficient valve port area imposing an abnormal restriction on the passage of the gas through the valves and a consequent loss of horsepower. The use of a valve so designed as to operate with a minimum of leakage is also assumed. The item of clearance between piston and head or in valve pockets will later be shown to have no effect whatever on this question of horsepower per unit of capacity within all practical limits.

In calculating the size of a compressor cylinder for certain requirements, the engineer obviously must be governed by the rated horsepower of the prime mover which is to drive it, be it gas engine, steam engine or electric motor, or, if it is a belt drive unit, the horsepower which will be available at the compressor piston rod. Knowing this, the problem is to choose the size compressor which will, when operated under the specified pressures, require as closely as possible the rated horsepower of the engine.

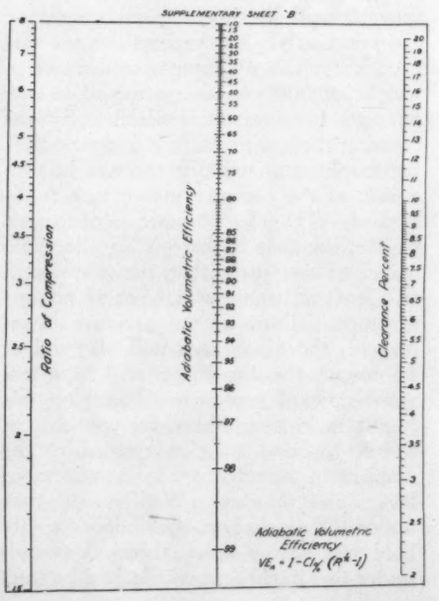
An explanation of the terms used in such calculations and subsequently referred to in this paper may be of interest to those unfamiliar with this work.

Piston displacement (PD) for convenience when herein referred to, is in terms of cubic feet per minute and equals in a double-acting compressor:—Net Piston Area (sq. in.) $\times$ stroke (inches) $\times$ two divided by 1728.

Clearance per cent (C1.%):—the total volume of the space in the valve pockets of the cylinder and between the end of the piston and the cylinder head divided by the volume or space swept through by the piston on one stroke. Expressed in per cent it may vary from as low as two to as high as fifteen, but its exact value must be known, not assumed, in making an accurate calculation.

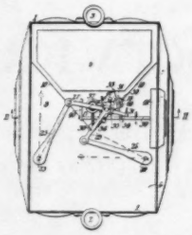
Adiabatic compression is one theoretical extreme in which all of the heat of compression is retained within the cylinder, none being transmitted from the gas to the cylinder walls and removed thence by jacket cooling.

(Continued on Page 60)



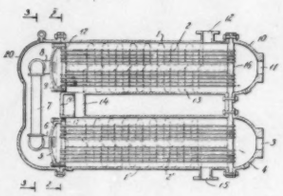
THIS MONTH'S PATENTS PERTAINING TO THE INDUSTRY

1,629,031. GAS-METER MECHANISM. WILFORD A. GAUGH, Erie, Pa., assignor to American Meter Company, Philadelphia, Pa., a Corporation of Delaware. Filed Oct. 28, 1924. Serial No. 746,345. 9 Claims. (Cl. 73—1.)



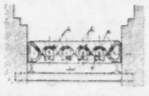
1. In a gas meter, the combination with a casing, of a crank shaft in said casing arranged to be operated by a flow of gas through the meter; a crank arm rigidly connected with the top of said crank shaft, a bracket in said casing, having a bearing encircling said crank shaft; said bracket having two slots in it, in parallel relation respectively tangential to circles of different radii and concentric with the axis of said shaft, a single fulcrum pin extending in said bracket across said slots; a trip lever hung on said pin in the slot of said bracket most remote from the axis of said crank shaft, and normally presented in the path of said crank arm, and arranged to be idly tilted by said crank arm at each revolution of said crank shaft in one direction, a stop lever, hung on said fulcrum pin in the other of said slots in coaxial relation with said trip lever and normally out of the path of said crank arm, said stop lever having a lateral projection extending transversely across the path of said trip lever, said trip lever being arranged to be tilted in the reverse direction by reverse rotation of said crank arm incident to the reverse movement of the meter mechanism to then engage said projection on said stop lever and set up the stop lever in position to stop the reverse rotation of said crank arm and the meter mechanism connected therewith, after more than one complete reverse revolution of said crank arm.

1,597,479. HEAT EXCHANGER. JOSEPH PRICE, Stapleton, N. Y., assignor to The Griscom-Russell Company, New York, N. Y., a Corporation of Delaware. Filed Mar. 3, 1925. Serial No. 12,907. 8 Claims. (Cl. 257—240.)



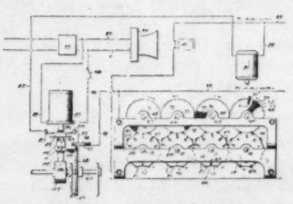
1. A heat exchanger of the class described comprising a plurality of heat transferring tubes, a fixed tube sheet for supporting said tubes at one end, a plurality of independent movable tube sheets supporting separate groups of said tubes at the other end thereof and a flexible connection for effecting transfer of fluid between said groups of tubes and permitting independent movement thereof.

1,595,425. GRATE FOR GAS PRODUCERS, FURNACES, AND THE LIKE. JEAN SAUVAGEOT, Paris, France. Filed June 3, 1924. Serial No. 717,503, and in France Nov. 21, 1923. 4 Claims. (Cl. 110—74.)



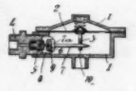
1. In a grate for gas producers, furnaces and the like, the combination of a supporting frame, hollow bars rotatably mounted in said frame and adjacent to one another, each bar being provided with a substantially semi-cylindrical portion extending substantially throughout the entire length of the bar, and normally forming the supporting surface of the grate, longitudinal ribs projecting from the surface of said bars opposite the semi-cylindrical portion and extending substantially throughout the length of said bars, and means for rotating adjacent bars in opposite directions.

1,621,939. METER-READING APPARATUS. JOHN C. LOWE, Minot, N. Dak. Filed Feb. 21, 1925. Serial No. 10,959. 9 Claims. (Cl. 177—352.)



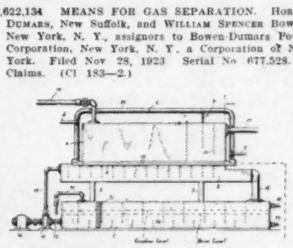
1. In apparatus of the character described, counting mechanism embodying a plurality of rotatable dials, each dial being provided upon its periphery with recesses, different contact units arranged within the recesses and adapted to produce a different signal for each recess, rotatable locking members arranged near the dials and corresponding in number with relation thereto, said locking members being adapted to pass through the recesses of the dials and to hold the dials against turning movement during such passage, contact elements carried by the locking member for co-action with the contact units, circuit means associated with the contact elements and contact units, and means to drive the locking members.

1,630,408. GAS-PRESSURE REGULATOR. HANS ROSENTHAL, Berlin, Germany. Filed Nov. 12, 1925, Serial No. 68,722, and in Germany Nov. 18, 1924. 2 Claims. (Cl. 50—26.)



1. A gas pressure regulator of the character described, including a casing having inlet and outlet openings, a pressure responsive device situated within the casing, a socket member insertable in the inlet opening of the casing in the direction of flow, a valve mounted on the socket member, a valve rod an enlarged end on said valve rod, a forked-shaped extension projecting from the socket member, a pin for mounting the enlarged end of the valve rod for oscillatory movement between the forked-shaped extension, the valve and valve rod being mounted on the socket member so as to be removable therewith, and a stud secured to the membrane and engaging said valve rod.

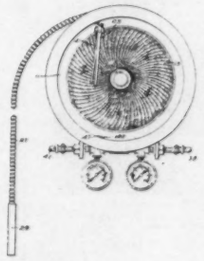
1,622,134. MEANS FOR GAS SEPARATION. HORACE DUMARS, New Suffolk, and WILLIAM SPENCER BOWEN, New York, N. Y., assignors to Bowen-Dumars Power Corporation, New York, N. Y., a Corporation of New York. Filed Nov. 28, 1923. Serial No. 677,528. 4 Claims. (Cl. 183—2.)



1. Apparatus for segregating a specific gas or gases from a mixture of gases having critical temperatures so related that one becomes liquid while another solidifies at said critical temperature, including a condensing chamber, a conveyer tank and a brine tank, said condensing chamber being in superposed relation to said conveyer tank, a member enclosing said condensing chamber and spaced therefrom forming a jacket for the reception of a refrigerating medium, means communicating with said condensing chamber for admitting and discharging the mixture, baffles in said chamber giving a tortuous flow to said mixture, collecting plates in the conveyer tank for receiving the solid condensate from said mixture, conduits connecting the opposite ends of said conveyer tank and brine tank forming a closed circulation system, a pump in said system producing a continuous flow through said conveyer and brine tanks and a discharge pipe in said brine tank having the lower end thereof at the proper level to withdraw a layer of non-miscible liquid condensate from said mixture which may collect in said brine tank.

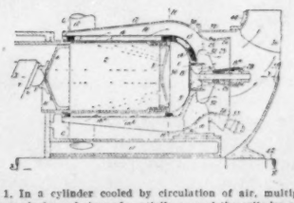
1,624,887. MEASURING AND CONTROLLING INSTRUMENT. EDGAR H. BRISTOL, Foxboro, Mass., assignor to The Foxboro Company, Foxboro, Mass., a Corporation of Massachusetts. Filed Aug. 10, 1920. Serial No. 402,665. 38 Claims. (Cl. 234—11.)

20. A combined recording and controlling instrument comprising a clock movement having a shaft, a dial plate rotatable thereby, a pen, a pressure responsive member moving the same, governing mechanism including a



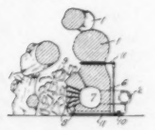
valve element operated by said member, a cooperating valve element and a cam on the time shaft for positioning said latter element.

1,621,943. AIR COOLING OF THE CYLINDERS AND PISTONS AND OTHER WORKING PARTS OF INTERNAL-COMBUSTION ENGINES, COMPRESSORS, AND THE LIKE. ANTHONY GEORGE MALDON MICHELL, Melbourne, Victoria, Australia, assignor to Crankless Engines (Aus) Proprietary Limited, Melbourne, Australia. Filed June 29, 1923, Serial No. 648,543, and in Australia July 18, 1922. 12 Claims. (Cl. 123—171.)



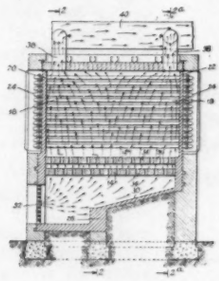
1. In a cylinder cooled by circulation of air, multiple channels formed circumferentially around the cylinder and having each a plurality of lateral inlets alternating with a corresponding plurality of lateral outlets for the circulating air, each inlet and outlet slot common to a plurality of channels, the length of each channel between inlet and outlet being many times greater than its smaller transverse dimension.

1,630,109. RADIANT GAS LOG. DEAN CHANDLER, London, England, assignor to South Metropolitan Gas Company, London, England. Filed Oct. 11, 1926, Serial No. 140,955, and in Great Britain Mar. 19, 1926. 2 Claims. (Cl. 126—92.)



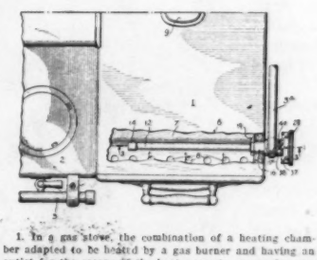
1. In a radiant gas log device, means for introducing through said log a mixture of gas and air to produce non-luminous flames and means for introducing through said log gas unmixed with air which is burned at points adjacent the non-luminous flames to produce luminous flames.

1,629,606. FURNACE. GEORGE DAVIS WHITE, Port Arthur, Tex., assignor to The Texas Company, New York, N. Y., a Corporation of Texas. Filed Sept. 7, 1923. Serial No. 661,337. 2 Claims. (Cl. 110—97.)



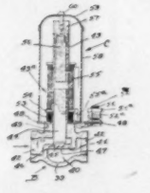
1. A furnace comprising a coil chamber, a coil disposed therein, a combustion chamber disposed beneath the coil chamber, a double checkered wall separating the coil chamber from the combustion chamber and provided with a plurality of staggered openings increasing in size from the center towards the front and rear to produce an even distribution of heat in the coil chamber, outlet flues disposed in the upper corners of the coil chamber, a main gas conduit communicating therewith, and adjustable dampers disposed in said flues for controlling the distribution of heat throughout the coil chamber.

1,630,966. GAS STOVE. HENRY W. O'DOWD, Jersey City, N. J., assignor to Standard Gas Equipment Corporation, a Corporation of Maryland. Filed Apr. 9, 1925. Serial No. 21,742. 5 Claims. (Cl. 126—39.)



1. In a gas stove, the combination of a heating chamber adapted to be heated by a gas burner and having an outlet for the escape of the heat currents, means for supplying gas to the burner, a thermostatic element located outside the heating chamber but in the path of the heat currents flowing therefrom and in position to be acted on by said currents immediately upon their leaving the heating chamber, and means operated by said thermostatic element for controlling the supply of gas to the burner.

1,624,132. GAS-CONTROL APPLIANCE. JAMES WALTER BROWN, Minneapolis, Minn., assignor to Brown Engineering Corporation, Minneapolis, Minn., a Corporation of Minnesota. Filed Mar. 26, 1921, Serial No. 455,931. Renewed Aug. 27, 1926. 1 Claim. (Cl. 137—139.)

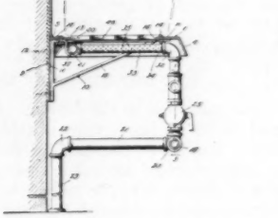


In a device of the class described, the combination with a heater, including a burner, coupled with a gas supply conduit and provided with means for lighting the same, of a gas cut-off mechanism incorporated in said conduit, including a vertically floating valve member adapted, in the absence of resistance, to fall into valve closing position, a solenoid magnet for lifting said valve member, a holding magnet to retain said member in elevated position, a control station at a point removed from the heater, two circuit completing devices at said control station, a circuit for energizing the lifting and holding magnets, including one of said circuit completing devices, and a second circuit for neutralizing the attractive force of said holding magnet, including the other circuit completing device.

1,622,089. ELECTRIC GAS LIGHTER. AXEL E. CARLSON, Moline, Ill. Filed Aug. 7, 1922. Serial No. 580,100. 11 Claims. (Cl. 175—91.)

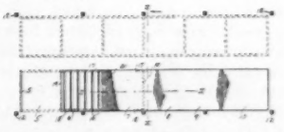
1. In combination of a gas lighter including a sparking rod having an arm extending laterally therefrom, a bracket of insulating material adapted to receive said arm, and means for interlocking said arm with said bracket.

1,630,030. GAS COOKSTOVE. BRAXTON F. RODGERS, Dallas, Tex. Filed Nov. 10, 1925. Serial No. 68,216. 2 Claims. (Cl. 26—39.)



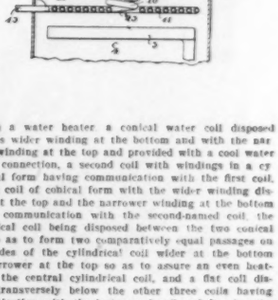
1. A cook stove comprising a utensil supporting plate having a burner opening therein, a horizontally disposed U shaped burner disposed below the opening, a back plate integral with the supporting plate for attachment to a wall, and hooks secured to the supporting plate and engaged with the right portion of the burner.

1,627,598. BRICK-KILN CONSTRUCTION. WILLIAM WALLACE DICKINSON, Jr., Little Rock, Ark. Filed May 28, 1926. Serial No. 112,227. 6 Claims. (Cl. 25—134.)

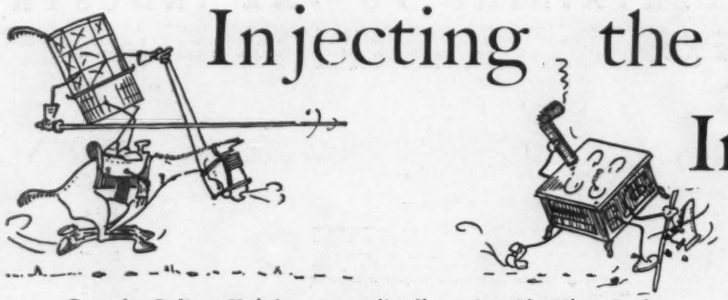


1. A plurality of adjacent units made up of brick placed for burning, having a division wall initially of unburned brick, between each two thereof, said wall being of less height than the said units, thereby providing initially a passage-way above said wall for gases of combustion between said units, and as burning and shrinkage of said wall progresses, providing additional direct passageways through said wall.

1,628,341. WATER HEATER. WILLIAM J. TOWLES, EUGENE L. TOWLES, and GEORGE M. TOWLES, Los Angeles, Calif. Filed Dec. 22, 1924. Serial No. 757,425. 2 Claims. (Cl. 122—250.)



1. In a water heater a conical water coil disposed with its wider winding at the bottom and with the narrower winding at the top and provided with a cool water supply connection, a second coil with windings in a cylindrical form having communication with the first coil, a third coil of conical form with the wider winding disposed at the top and the narrower winding at the bottom having communication with the second-named coil, the cylindrical coil being disposed between the two conical coils so as to form two comparatively equal passages on both sides of the cylindrical coil wider at the bottom and narrower at the top so as to assure an even heating of the central cylindrical coil, and a flat coil disposed transversely below the other three coils having communication with the last-named coil and forming the water outlet of this coil system.



Injecting the *Romance* Into Gas Service

By W. M. HENDERSON
Superintendent Gas Distribution
Los Angeles Gas and Electric Corp.

Gas, the Gallant Knight, summarily dispatches Old King Coal.

¶ Mr. Henderson's venture into the realm of romance, which appeared originally in the L. A. Service Review, is incontestable evidence that gas is not an altogether dry matter—strive as the distribution departments may to dehydrate it. We print excerpts only.

ROMANCE always appeals to folks. Some never get their fill. We have it in architecture, in furniture, in the movies and of course in love affairs. Appealing to that sentimental taste, I'll inject a bit of romance into the gas industry.

GAS, THE GALLANT KNIGHT

All romance has a fair maiden in distress, and a hero bold and fearless. Where is there a more fitting setting to be found than in the average kitchen? Along comes Gas, the Gallant Knight, with his squires and heralds, down through the ages. He charges Old King Coal; disperses the last cord, or lost chord, of wood; saves the imprisoned Cinderella from her cell of drudgery, and places her on a throne of convenience and comfort as the Queen of the Domestic Household. That is romance!

Such has been the struggle of gas to establish itself as a community necessity. Away back in 1790 gas was in the first stages of development. Prior to that period early investigators had, by experiment, produced an inflammable substance, named by Van Helmont "geist" a Flemish word meaning spirit. From this we readily translate the word gas, meaning, "The spirit of service."

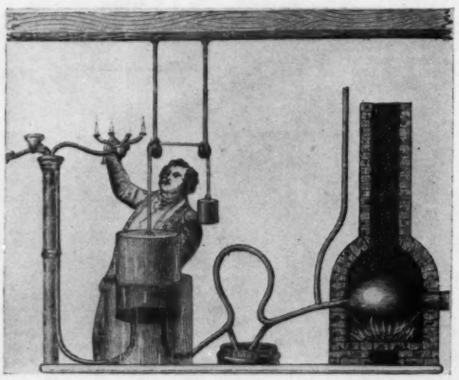
FIRST COMMERCIAL USE

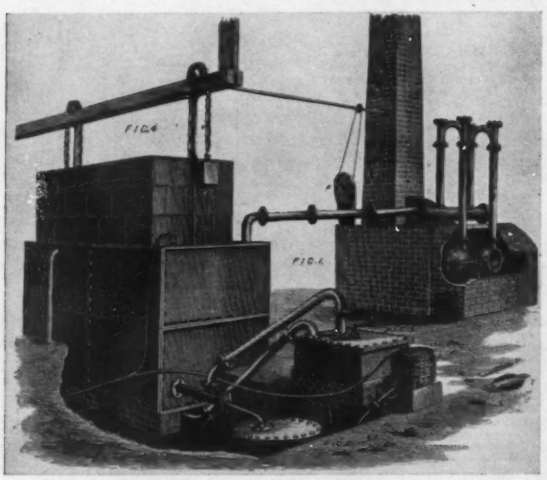
It was Murdock, an English scientist and inventor, who made the first commercial use of gas. It is difficult for us with all the resources we possess today, to realize the circumstances under which the early pioneers labored. There was very little, if any, mechanical development at the time, and nothing in the nature of established practice from which to draw suggestions. Mere gas itself must have been to Murdock something that smelled, or, when ignited, burned a while and disappeared. To produce was not difficult, but the proper development of equipment for making, storing and delivering gas in quantities was the problem to surmount.

SLOW PROGRESS AT FIRST

Progress was slow in the beginning, as new ideas never do get over without some resistance, and "the same old gang" was there to obstruct. Gas, at first, was offered only as an illuminant to replace candles and whale-oil lamps. The cry went forth that lighting of the public streets with gas would encourage foot-pads. Lighting of stores and shops would allow industry to work nights to the detriment of the public health, it was said.

That was not all—politics took a hand. Whale boats went into the Far North to secure whale oil for the market. England encouraged the service, for this merchant marine furnished and developed sailors for her navy. The gas business, requiring coal, would develop a coastal trade which naturally did not produce the hardy calibre of sailor required, so the matter of discouraging the gas business was long debated in Parliament.



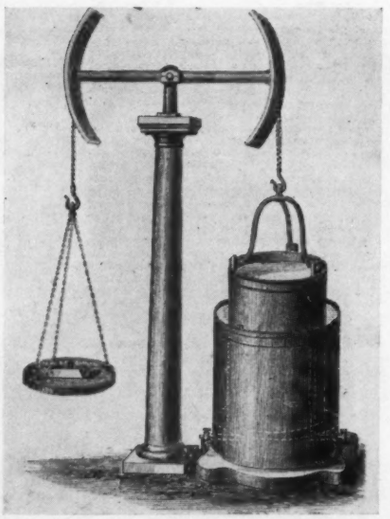


SOME PIONEERS OF THE MODERN GAS PLANT

ABOVE: *A demonstration set of coal gas apparatus. From Parker's "Chemical Catechism," published in 1810.*

LEFT: *This gas works was constructed in 1812 for lighting a private residence.*

What is gas? Coal with the soot removed; wood with the ash eliminated; oil without smoke. In fact, it is fuel with an artistic temperament.



The first gas holder served as a governor to maintain constant pressure. Compare this one with the present day gas holder. Reproduced from an early cut appearing in Academie des Sciences, 1789.

The whole problem of fuel is one that ties up with health, comfort, civic beauty and economy. The practice of using solid fuel today is but a tradition.

THE VIRTUES WITHOUT THE ANNOYANCES

Gaseous fuels are doing battle with the soot nuisance. This is more in evidence in Eastern centers, but deserves mention, as the damage from such source runs into millions of dollars yearly. That is the price paid by a community when it entertains a fuel that cannot be controlled. Whereas gas, the "captive fuel," refined and domesticated, possesses all the virtues of solid fuel and is free from the annoyances.

There are three basic requirements of man—light, warmth and food—all other wants are the result of advertising. Gas serves all three of these essential needs—light and warmth directly, and food indirectly, through cooking.

GAS IS SAFE

Occasionally one hears, from the unthinking gossip, insinuations that gas is dangerous. Of course some hear-say remarks are offered as proof. One might remark, also, that beds are dangerous, for more people have died in bed than from any other cause. But, here is the best answer to any of the exaggerated whisperings of such gossip: The Royal Insurance Company, Ltd., a British Company, has recently put forth a new pol-

icy to cover residences against fire; they offer a ten per cent reduction on the annual premium if premises are equipped with gas appliances.

Here rests the case for Gas. In pleading the evidence, we do so in the interest of the Public in an action brought against Drudgery et al to recover health, convenience and economy.

GAS TEAM TAKES PANAMA BASEBALL TITLE

The baseball championship of Panama was won this year by a team from the Panama-Colon Gas Company, the gas house boys bringing victory out of a three-team tie-up for first honors. This year was the first season for the Panama National Baseball League, which was organized with a membership of six teams.

ROCKWELL TO HEAD RIO GRANDE VALLEY GAS CO.

C. O. Rockwell has resigned his position as assistant manager of the New York Oil Company, Casper, Wyoming, to become general manager of the Rio Grande Valley Gas Company, with his headquarters in Brownsville, Tex. Rio Grande Valley Gas Company has franchises to serve some fourteen towns of southern Texas in the Rio Grande Valley, and is constructing a gas line from the Jim Hogg county fields, together with distribution systems in the communities.

CAPITAL G. & E. EMPLOYEES STUDY UTILITY SUBJECTS

A series of educational meetings has been in progress for some months among employees of the new business department of the Capital Gas & Electric Company, Topeka, Kansas. A correspondence course on public utilities, obtained from the Pennsylvania state College formed the basis of the sessions, which were held on Friday nights, under the direction of Professor W. A. Irwin, head of the economics department of Washburn.

SURVEY INDUSTRIAL GAS OUTLOOK IN NEW ORLEANS

Ford, Bacon & Davis, engineering firm of New York, now building a natural gas line between Destrehan and Baton Rouge, La., are reported by the New Orleans Public Service, Inc., to be making a survey of industrial gas utilization possibilities in New Orleans.

LONE STAR ACQUIRES WEST TEXAS PRODUCING PROPERTIES

The Lone Star Gas Company, with headquarters in Dallas, recently acquired the West Texas gas producing properties of the Texas Company. The transaction gives the Lone Star gas wells, pipe lines, compressor stations, and local distributing systems in 10 West Texas towns, including Albany, Abilene, Clyde, Baird, Putnam, Cisco, Eastland, Sedwick and Crystal Falls. It is reported that the Lone Star plans to extend the system westward to Sweetwater, Colorado City and other towns.

CEMENT PLANT MAY BUILD NEAR VENTURA, CALIF.

White Crown Products Company of Los Angeles, Calif., is considering the location of a $1,000,000 cement manufacturing plant near Matilija, Ventura County, Southern California. A number of California cement plants are among the largest users of industrial gas in the state.

Southern California Gas to Buy Midway, Valley Natural

FORMAL application was made to the California Railroad Commission on June 30 by the Southern California Gas Company for authority to buy the Midway Gas Company and the Valley Natural Gas Company. This follows closely upon a similar application filed by the Southern California Company for permission to purchase the Central Counties Gas Company, Hanford Gas and Power Company, and River Bend Gas and Water Company. Upon the consummation of these consolidations the Southern California Gas Company will operate in the territory from the Los Angeles basin north to Dinuba, Hanford, and Visalia, in the San Joaquin Valley, and from Ventura on the west to Redlands, Riverside, and San Bernardino.

The application asks for permission to issue and sell $35,000,000 worth of five per cent thirty-year bonds, to be secured by a new mortgage which will be a first lien on the combined properties. This will involve the redemption of all outstanding bond issues as follows:

Southern California Gas;		
First Mortgage, 6's of 1950	$4,354,000	Callable at 105
First and Refunding 7's of 1951	2,747,000	Callable at 107½
First & Refunding 5½'s of 1952	6,200,000	Callable at 105
First & Refunding 6's of 1958	4,000,000	Callable at 105
Midway Gas Company;		
First & Refunding 6's of 1929	883,000	Callable at 100
Central Counties Gas Company;		
First Mortgage 6's of 1939	484,000	Callable at 103
Convertable Debentures, 7's of 1929	78,000	Callable at 102
River Bend Gas & Water Company;		
First Mortgage 7's of 1942	190,000	Callable at 104
Hanford Gas & Power Company;		
First Mortgage 6's of 1937	70,000	Callable at 101

The Southern California Gas Company, during its 20 years of operation, has grown to be one of the largest distributors of gas in the world. In Los Angeles, San Bernardino, and Riverside Counties, Southern California, it now serves domestic and industrial customers in over 70 cities and communities, and sells natural gas to other utilities.

The Midway Gas Company was originally organized 15 years ago to bring natural gas from the Midway fields, near Taft, to Los Angeles. Since that time the company has expanded its activities so that at present it brings gas from every important field in Southern California, which it sells to the Southern California Gas Company and other companies retailing gas in Southern California.

A. B. Macbeth, executive vice-president of the Southern California Gas Company, stated that the consideration for the sale was expected to be between $12,000,000 and $13,000,000.

SALES GAIN WHEN NEW STORE OPENS

Proof of the definite value of company appliance stores in sales work is seen in the Portland Gas & Coke Company's new store at Oregon City. Since its opening two months ago sales in this territory have increased six-fold, through sales made at the store and outside sales work done by one representative on half time.

GAS REGULATOR PLANT

W. M. Thompson, president of the Reliance Manufacturing Company of Pasadena, Calif., announces that his company has let a contract for the erection of a plant at Alhambra, Calif., at a cost of $100,000. Plans call for the plant to be completed by September 15th. According to Mr. Thompson, this will be the largest plant in the United States devoted exclusively to the manufacture of gas regulators.

ASKS TEXAS CHARTER

The Southwest Gas Company has filed application for a charter with the Secretary of the State of Texas. The new company is a consolidation of the MacThwaite Oil & Gas, Pontotoc Pipe Line, DeLeon Gas Company, Tri-Cities Gas Company, and others supplying natural gas in central Texas and Oklahoma.

EMRICK GETS SECURITIES POST IN DENVER

R. A. Emrick, formerly in charge of securities sales in the western division for the Public Service Company of Colorado, has been made first assistant securities manager of the Denver offices of that company, having direction of securities sales in the entire state outside of Denver.

FIELDNER MADE SUPT. BUREAU OF MINES STATIONS

Arno C. Fieldner, superintendent of the Pittsburgh experiment station of the United States Bureau of Mines, Department of Commerce, has been appointed to the position of Chief Engineer, Division of Experiment Stations, of the Bureau, effective July 1. In his new position, Mr. Fieldner will correlate the scientific activities of the Bureau's experiment stations located at Pittsburgh, Pa.; Salt Lake City, Utah; Reno, Nev.; Berkeley, Calif.; Tucson, Ariz.; Seattle, Wash.; Bartlesville Okla.; Rolla, Mo.; Minneapolis, Minn.; Birmingham, Ala., and New Brunswick, N. J. At these experiment stations problems dealing with the elimination of waste in the different mineral industries are being studied.

Mr. Fieldner, who has served as superintendent of the Pittsburgh experiment station for the past six years, has twice been chairman of the Chemical Committee of the American Gas Association, and is a continuing member of the Managing Committee of the Technical Section of this organization.

A. B. DAY BACK ON COAST

A. B. Day, executive vice-president and general manager of the Los Angeles Gas & Electric Corp., returned in June from a six-weeks trip east.

HINCHEY GOES WITH PRAIRIE OIL & GAS COMPANY

Ray F. Hinchey, for the past three years manager of the Okmulgee Gas Company, Okmulgee, Okla., which was recently purchased by the Oklahoma Natural Gas Company, has resigned to become gas engineer for the Prairie Oil & Gas Company. He will be located at Independence, Kansas.

Produce More Carbon Black, *but* Sales Decrease

THE production of carbon black from natural gas in 1926 was 180,576,176 pounds, valued at the plants at $9,939,221, according to G. R. Hopkins, of the United States Bureau of Mines, Department of Commerce. This represents an increase in production over 1925 of 3,163,798 pounds, or 2 per cent, which was, however, insufficient to eclipse the record figure of 186,872,034 pounds established in 1924. Stocks at the plants December 31, 1926, amounted to 108,378,101 pounds, an increase of 12,354,653 pounds, or 13 per cent, over the preceding year. Losses at the plants in 1926 totaled a little over 700,000 pounds or about half what they were in 1925.

The production minus the addition to stocks and the losses gives total deliveries or sales for 1926 as 167,504,710 pounds as compared with 175,631,326 pounds in 1925, a decrease of 8,126,616 pounds, or 5 per cent. This is the first time since carbon black statistics have been compiled that total sales have shown a decrease.

The distribution of carbon black deliveries among industries in 1925, as determined by a survey only recently completed, was as follows:

	Pounds	Per cent
Rubber	86,329,000	49.2
Export	43,183,000	24.6
Ink	22,389,000	12.7
Paint	11,757,000	6.7
Miscellaneous	11,973,000	6.8
Total	175,631,000	100.0

The total value at the plants of the carbon black production in 1926 was approximately $10,000,000, or an average of 5.5 cents per pound.

The estimated quantity of natural gas used in 1926 to produce the 180,576,176 pounds of carbon black was 130,321,000 M cubic feet. This indicates an average yield of 1.4 pounds per 1,000 cubic feet of gas, an increase of 0.1 pound over 1925 and the highest yield ever recorded.

LOUISIANA LARGEST PRODUCER

Louisiana remained the outstanding producing State, its output in 1926 of over 130,000,000 pounds comprising 72 per cent of the total for the country. West Virginia produced 3,804,586 pounds of carbon black in 1926, a decline of 7,043,208 pounds, or 65 per cent, from 1925. This State, once the leader in the industry, is now producing only 15 per cent of its output of six years ago and only 2 per cent of the output of the country. Carbon black manufacture at present prices is dependent on cheap gas, of which there is little left in West Virginia. Texas showed the greatest gain in production of any of the States, its output amounting to 36,328,052 pounds as against 26,219,510 pounds in 1925, a gain of 39 per cent. This material increase more than compensated for the decline in West Virginia and Kentucky. Three new plants began operations in Texas in 1926, two of them in Stephens County and one in Hutchinson County. The latter was the first carbon black plant to enter the great Amarillo gas field, though many have been projected.

The channel process remained by far the most important method of manufacturing carbon black, producing 152,300,410 pounds in 1926, as compared with 28,275,766 pounds by the other processes.

Exports of carbon black in 1926 amounted to 39,210,389 pounds as compared with 43,182,635 pounds in 1925. The 1926 exports had an average value of 9.2 cents, as compared with 8.2 cents in 1925. The United Kingdom was our leading carbon black customer in 1926, followed in order by France, Canada, and Germany. Of these four countries France showed the greatest increase over 1925.

UTILITIES POWER & LIGHT BUYS LA CLEDE PROPERTIES

The Utilities Power & Light Corporation, Chicago, has bought the common stock of the Laclede Gas and Electric Company, which carries with it control of the Laclede Gas Light Company of St. Louis, Mo. The purchasing company operates utility properties in 12 states. An extensive campaign for industrial gas business will be undertaken in St. Louis under the new control.

HOUSTON TO PUMP BY GAS INSTEAD OF OIL

The central pumping plant of the Houston, Tex., water works has switched from fuel oil to natural gas for fuel purposes, thereby effecting a saving estimated at between $15,000 and $20,000 per year for fuel costs. The city council granted permission to James H. B. House, water commissioner, to have the change made in such fuel lines as were necessary, at a meeting during the latter part of June.

BORCHART GETS OFFICE

Henry A. Borchart is now superintendent of insurance and investigations for the Oklahoma Gas & Electric Company, Oklahoma City, as a result of a recent appointment.

LINE FROM REFUGIO FIELDS TO WHITE POINT DISTRICT

The Houston Gulf Gas Company is laying 35 miles of 12-inch pipe line from the Refugio gas fields to the White Point district, across the Neuces Bay from Corpus Christi.

H. V. PAYNE TO MANAGE BAY BRANCHES OF PAYNE FIRM

Payne Furnace and Supply Company, Inc., of Beverly Hills, Calif., announces the appointment of H. V. ("Harry") Payne as manager of its Oakland and San Francisco branch offices. H. V. Payne was formerly in charge of the Pasadena Branch Office.

GAS SURVEY IN MONTANA

Several of the larger gas producers in the Kevin-Sunburst field of Montana are making a gas survey, looking to the laying of a gas line to supply Great Falls, Helena, Butte and Anaconda, in the event that supplies seem sufficient.

SERVICE BY JULY 10

It is expected that the gas distribution system of the Community Natural Gas Company will be completed at Waurika by July 10, and that gas service can begin at that time.

MORGAN BUYS INDUSTRIAL GAS CO. TO SERVE BROWNSVILLE

According to recent announcement M. B. Morgan has purchased for the Morgan Utilities Company, the holdings of the Industrial Gas Company, a corporation under the direction of Patterson and Miller, Brownwood men, for $67,500. Morgan Utilities has been granted a franchise by the city council to serve Brownwood with natural gas and the new company will operate under this franchise. Mr. Morgan states that his company will begin laying pipe for new lines and extensions at once.

LOS ANGELES ORDINANCE MAKES FURNACE HISTORY

ON June 24 the mayor of Los Angeles, Calif., placed his signature on what is declared to be the first ordinance in the United States covering the installation of gas furnaces.

The furnace ordinance provides for the payment of a $2.00 fee to the city by those installing furnaces; the ordinance contains measures providing for the submission of complete plans and specifications for each installation, showing compliance with the city ordinance; specifying that provision shall be made in building construction for necessary space in which to install heat pipes, and for an adequate basement for the furnace location; requiring that each type of furnace sold shall receive the approval of the Board of Building and Safety Commissioners; requiring minimum pipe sizes and maximum lengths, and coverings for pipes. Definitions of various heating terms are also included in the ordinance.

Investigations leading to the adoption of the ordinance by the Los Angeles city council were sponsored by the Gas Furnace Association of Southern California.

Another development which is significant for the gas industry in Los Angeles is that of May 28, on which date a position of heating and ventilating engineer was created in the city by council and mayor's action.

BUREAU DOING IMPORTANT WORK ON NATURAL GAS

For a considerable time the Bureau of Mines has been working on the major problem of methods of natural gas production and transmission, some phases having been investigated sufficiently to be made the subject of Bureau reports. Edwin L. Rawlins, associate natural gas engineer of the Bureau, with headquarters at the Bartlesville, Okla., experiment station, writes *Western Gas* that reports are in process of publication on the following subjects in this general field:

(1) Leakage Losses from Transmission Lines.

(2) Lifting Water from Natural Gas Wells.

(3) Flow of Gas through Small Orifice under High Differential Pressures.

(4) Use of Small Orifices to Control Flow from Gas Wells.

At present the Bureau has under investigation the following two problems:

(1) Flow of Natural Gas through Transmission Lines and Pipe Line Flow Formulae.

(2) Physical Properties of Natural Gas; Principally Compressibility, Viscosity, Gravity and Composition.

These investigations will be extensive, says Mr. Rawlins, since it is planned to test pipe lines and select gas samples from practically every natural gas district.

CANADIAN COMPANY TO SERVE STAVELY, ONTARIO

The Canadian Western Natural Gas, Light, Heat, and Power Company of Calgary, Ont., is planning the immediate building of a four mile pipe line to deliver gas from its main line to the town of Stavely, Ont. A franchise was granted the company by the Stavely community about 15 years ago, but until the present it has not been exercised.

NEW COMPANY JOURNAL

"Gas Service Journal", a new monthly publication, has been inaugurated as a mouthpiece for the Pittsburgh Equitable Meter Company, Pittsburgh, Pa. Two issues have already greeted the many friends

GAS DOES ITS BIT IN FLOOD STRICKEN REGIONS

Hugh M. Blain, director of the Louisiana-Mississippi Public Service Information Bureau, writes *Western Gas* that the gas industry contributed its quota of service in flood time in his territory. In several cases gas was the means of providing continuous electric service—which sounds like a paradox, but isn't—as in the case of towns like Greenville, Miss., which gets its electric supply from the big gas-fired power plant at Sterlington, La. This plant burns gas from the Monroe natural gas field, and the Louisiana Power and Light Co., Mississippi Power and Light Co., and Arkansas Power and Light Co., run transmission lines to more than 100 communities now in the flooded sections of these states.

Manufactured gas service in flooded towns was, of course, interrupted, but has been available with little trouble as flood waters recede. Shreveport, La., which gets natural gas from nearby fields, would have been without gas but for the foresight of the Southwestern Gas and Electric Co., which supplies the city. Several other of its pipe lines were washed away, but the precaution of running lines from several fields enabled the company to give full service to both domestic and industrial customers.

UTILITY SUMMER COURSES

The Northwestern University School of Commerce, in Chicago, announces that it will as heretofore offer two courses of instruction in Public Utilities during the summer session of 1927. These courses will afford an opportunity for a full program of work for those interested. The course in Principles of Public Utilities will be offered by Professor James P. Adams of Brown University, and the Graduate Seminar will be under the direction of Professor H. B. Dorau.

UNION GAS CORP. ELECTION FOR DIRECTORS, OFFICERS

The following directors of the Union Gas Corporation were elected at the company's annual meeting at company offices in Independence, Kansas: W. D. Pratt and B. E. LaDow, of Fredonia; M. L. Truby, Paul R. Johnson, Geo. T. Guernsey, Geo. T. Guernsey, Jr., F. W. Bacon, Geo. B. Blanchard, Wm. H. Wildes, C. B. Ewart, Donald W. Stewart. By vote of the directors, M. L. Truby was chosen president; Paul R. Johnson, vice president; W. D. Pratt, vice president; Donald W. Stewart, secretary; H. F. Mitchell, treasurer; Vernon F. Palmer, assistant secretary; W. L. Orr, assistant treasurer.

OIL BURNERS PROMOTED

Sale of oil burners is to be promoted this year. At the spring convention of the American Oil Burner Association the Oil Heating Institute was organized to supply the public with information about oil heating by means of advertising in general and trade magazines, and by newspaper publicity.

WATER GAS MACHINE BUILT IN RECORD TIME

Completing the construction of a Steere water gas machine in 31 days from the date of signing the contract for the job is the record set up by the Semet-Solvay Engineering Corporation of New York. On May 16 the company took an order to build the machine for the Wisconsin Gas and Electric Company, Waukesha, Wis., and the machine went into active service on June 16.

A group of gas equipment people are snapped above, during a world tour from which the party will return in September. The picture was taken in May, and the background stamps the location. WESTERN GAS *did not get the names of the "sheiks," but those mounted on camels are, left to right: Mrs. A. P. Bartley, wife of A. P. Bartley, Pacific Coast manager for the Lattimer-Stevens Company; H. W. Jackson, brother to Mrs. Bartley, and vice-president of the James Graham Manufacturing Company, San Francisco; Miss Etta B. Graham, president of the James Graham Manufacturing Company; and Mrs. H. W. Jackson.*

TESTING PONCA CITY LINES

Following the decision of the Ponca City Gas Distributing Company to test all its service lines in Ponca City up to the point where they serve the individual residences, the city authorities have passed a resolution authorizing the city manager to employ a man to test all gas fixtures and lines on the premises of customers.

ELECT OFFICERS OF L. A. G. & E. EMPLOYEE GROUP

Officers and directors of the Los Angeles Gas & Electric Corporation's Employee Association were elected at a meeting held June 14, being subsequently installed at a banquet, entertainment and ball, combined.

William Maddock was chosen president, after a term as vice-president. Oscar Cook is now vice-president, and Arthur Maltitz is treasurer. Two directors at large and seven divisional directors were also elected. The L. A G. & E. association is a flourishing one, with a membership somewhere in the neighborhood of 2300, about 80 per cent of the regular working force of the corporation.

FUEL ENGINEERING COURSE

The University of Pennsylvania is offering a comprehensive course in fuel engineering in September of this year. Gas men contributing lectures give the course a very practical character.

SNAP-O-STAT SALES FIRM IN LOS ANGELES OFFICE

Shaffer-Welch Sales Corporation, general sales managers in the United States for Snap-O-Stat automatic fuel control valves, has announced the opening of sales offices in the H. W. Hellman Building, Los Angeles.

25 MILES OF TEXAS CITY LINE NOW COMPLETE

The Houston Pipe Line Company has laid about 25 miles of the 35-mile 16-inch line which will connect Texas City on Galveston Bay, with its main line at Alvin, Texas, and with the work proceeding at its present rate, the company will be serving industries at Texas City within the next few weeks. The same company is laying 20 miles of line, skirting the city limits of Houston on the north, to furnish gas for domestic purposes to the suburbs, following the recent rejection by the Houston city commissioners of the company's offer to furnish gas for domestic consumption at the rate of 65 cents per thousand feet for a period of ten years.

COOPER EXECUTIVES ON WEST COAST IN JUNE

F. H. Thomas, vice-president of the C. & G. Cooper Company, Mt. Vernon, Ohio, and H. A. Gehres, chief engineer, spent ten days in Southern California in June with J. W. Reed, Western Representative for the company. The Cooper men were present at the beginning of service at the Ventura Fuel Company's compressor plant at Ventura.

FRANK BIVENS RETURNS

Frank Bivens, general agent of the Southern Counties Gas Company, has returned from a vacation trip to the Hawaiian Islands. He was accompanied by Mrs. Bivens and they sailed on board the "City of Honolulu" on May 28.

AMARILLO GAS CO. BUILDING ADDITION ON 3RD STREET

The Amarillo Gas Company, serving industrial and domestic users in Amarillo, Tex., is enlarging its quarters by an addition now being made to its building on East Third street.

FURNACE MEN BANQUET

On June 30 the Gas Furnace Association of Southern California held its semi-annual get-together in the banquet rooms of the Elite Cafe. The direct purpose of the meeting was to give recognition to the passage of the furnace installation amendment to the city building ordinance, representatives of the city building department being honor guests. The meeting was arranged by George Finney, secretary of the furnace organization.

WORLAND OFFICES OPENED

Midwest-Wyoming Gas Company has opened offices in Worland, Wyoming, preparatory to beginning gas service when the line from the Little Buffalo Basin is complete.

CHAMBER LISTS GAS AS BIG MANUFACTURING ASSET

The industrial department of the Los Angeles Chamber of Commerce has issued an extensive industrial survey of the Los Angeles county and metropolitan industrial district. One of the prime advantages held forth to prospective industries is the presence of natural gas as fuel.

FOSHAY BUYS POCATELLO CO.

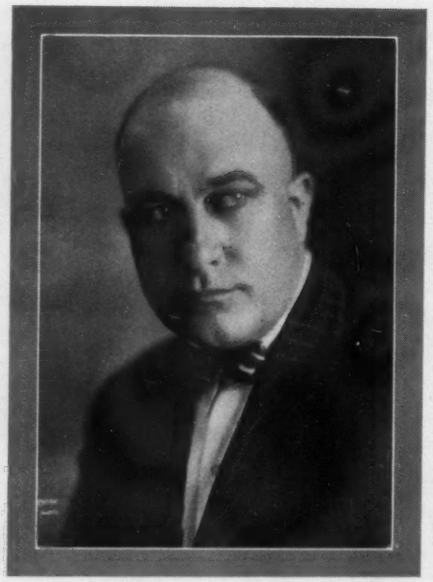
Through a subsidiary company the Public Utilities Consolidated corporation, recently organized by the W. B. Foshay Company of Minneapolis, will take over the properties of the Pocatello Gas & Power Company, Pocatello, Idaho, it was made known in June. This marks the first entrance of the Foshay organization into the gas business in the far West.

BATON ROUGE COMPANY MAKES ACCOUNTING CHANGE

The Baton Rouge Electric Company, Baton Rouge, La., has installed a new accounting system, which replaces eight forms with a single form, and is used for both gas and electric sales recording.

GAS FOR DODGE CITY

Dodge City, Kansas may have gas from a newly discovered field at Hugoton.



Claude C. Brown

Commission Appoints Gas Administrator

EFFECTIVE July 1, the Railroad Commission of California has appointed Claude C. Brown, gas engineer of the Commission, as natural gas administrator for Los Angeles and vicinity. This action is in line with a stipulation entered into on March 12 of this year between the Commission and the gas companies involved—the Los Angeles Gas and Electric Corporation, the Southern California Gas Company, Midway Gas Company, and the Southern Counties Gas Company.

The gas administrator will have supervision over the allocation of the supply of natural gas and its distribution, and will have physical supervision of the operation of the companies' oil gas plants. Orders for discontinuance of service to industrials not classed as "essential" will, during times of peak domestic demand come from the gas administrator. Expenses of the office will be covered by the gas companies, including the $425 monthly salary of the administrator.

Mr. Brown, who has served as gas engineer for the Railroad Commission for the past four years, will continue in that capacity, though he will be given assistance so as to free his time for his new duties. He is a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Petroleum Institute and the Pacific Coast Gas Association.

The new arrangement, according to the Commission, is expected to work out to the best interests of all the companies affected, providing an impartial control of this phase f their operation, and making possible full co-operation in the direction of conservation and effective utilization of the available gas supplies.

GAS SCHOLARSHIP

H. B. Rust, president of the Koppers Company of Pittsburgh, Pa., has presented a yearly scholarship of $450 for four years to the gas engineering department of the Johns Hopkins University, according to Wilbur J. Huff, professor of gas engineering at that institution.

KANSAS CITY MAIN GOING INTO INDUSTRIAL AREA

In line with a policy of encouraging the industrial use of gas, the Kansas City Gas Company has under construction a 20-inch gas main which will extend six miles into the Blue Valley industrial district on the east side of the city.

MINNEAPOLIS HEAT REGULATOR MANAGERS HOLD MEET

All branch managers and district representatives of the Minneapolis Heat Regulator Co. gathered in Minneapolis during June for the company's annual sales convention. The convention was held in the auditorium of the company's new factory building, which was put into use in June.

GAS FIELDS AND LINES IN WYOMING AND MONTANA

Table courtesy of Midwest Refining Company, Casper, Wyoming

COMPANY	FIELD WYOMING	MARKET	USE	Original Reserve	Present Reserve	Original Pressure	Present Pressure	Size Line	Length Line	Daily Deliveries
New York Oil	Casper Cr.–Poison Spider–Boone Dome	Casper	Domestic–Industrial	18 Billion	3 Billion	500–750	——	6″–12″	42 Mi.	100,000
New York Oil	Teapot Dome	Casper	Texas Refinery	29 Billion	15 Billion	1050	550	8″	45 Mi.	3,500,000
New York Oil	Big Sand Draw	Casper & Glenrock	Dom.–Cont.& Std. Ref.	125 Billion	100 Billion	1025–1400	900–1020	10″–12″	122 Mi.	8,500,000
New York Oil	Big Sand Draw	Lander & Riverton	Dom. & Carbon Plant	125 Billion	100 Billion	1025–1400	900–1020	4″–6″	48 Mi.	7,500,000
New York Oil	Baxter Basin	Rock Springs	Domestic	130 Billion	122 Billion	1100	800	6″	22 Mi.	800,000
Producers & Refiners	Wertz–Ferris–Mahoney	Casper	Standard Refineries	120 Billion	70 Billion	800–1800	200–1200	10″–12″–14″	90 Mi.	30,000,000
Producers & Refiners	Eight Mile Lake	Parco	P. & R. Refineries	5 Billion	1 Billion	675	——	8″	15 Mi.	500,000
P. & R. (P. O. & G.)	Mahoney	Parco	P. & R. Refineries	78 Billion	33 Billion	800–1200	600–1000	8″–10″	33 Mi.	8,000,000
Ohio Oil Co. (R. M. G.)	Mahoney	Rawlins & Parco	Domestic	78 Billion	33 Billion	800–1200	600–1000	6″–8″	41 Mi.	2,700,000
Ohio Oil Co. (R. M. G.)	Oregon Basin	Cody	Domestic	12 Billion	10 Billion	400–700	300–675	4″	13 Mi.	200,000
Ohio Oil Co. (R. M. G.)	Byron	Powell	Domestic	24 Billion	4 Billion	400–900	100–300	6″	12 Mi.	200,000
Lovell Gas & Electric	Byron	Lovell	Sugar Ref. & Dom.	24 Billion	4 Billion	400–900	100–300	6″	8 Mi.	1,400,000
Occidental Gas	Byron	Cowley	Domestic	24 Billion	4 Billion	400–900	100–300	4″	6 Mi.	100,000
Thermopolis Gas	Little Dome	Thermopolis	Domestic	3 Billion	2 Billion	1142	700	4″–6″	34 Mi.	400,000
Midwest–Wyoming Gas	Hidden Dome	Basin & Greybull	Dom. & Std. Refineries	27 Billion	5 Billion	540	100	8″	34 Mi.	4,000,000
Midwest Refining	Salt Creek	Casper	Std. Refineries	Residue	Gas from	Comp.	Plants	10″	42 Mi.	7,000,000
Midwest Refining	Little Buffalo Basin	Grass Creek	Field	60 Billion	50 Billion	600	435	3″	13 Mi.	400,000
Ohio Oil Co. (Galatin)	Elk Basin	Billings	Domestic–Industrial	47 Billion	42 Billion	925	800	8″–10″	66 Mi.	3,000,000
	MONTANA									
Ohio Oil Co. (Galatin)	Kevin	Shelby	Domestic	20 Billion	18 Billion	500	350	6″	6 Mi.	500,000
Hardrock (T. S.)	Kevin	Sunburst	Domestic & Refinery	20 Billion	18 Billion	500	350	4″–6″	21 Mi.	400,000
Montana Gas Corp.	Bowes	Havre–Chinook	Sugar Ref. & Dom.	14 Billion	13 Billion	300	290	6″	32 Mi.	300,000
Dakota Power	Baker	Glendive	Domestic	6 Billion	5 Billion	400	350	6″	42 Mi.	500,000
				640 Billion	460 Billion					80,000,000
PROPOSED LINES										
Big Horn Gas	Little Buffalo Basin	Worland & Greybull	Dom. & Std. Ref.	60 Billion	50 Billion	500	435	8″–12″–14″	74 Mi.	15,000,000
Hope Engineering	Baxter–Hiawatha	Salt Lake & Ogden	Dom.–Industrial	150 Billion	142 Billion	800	750	18″	200 Mi.	25,000,000
Ohio or Hope	Sweetgrass–Kevin	Great Falls	Dom.–Anaconda	35 Billion	33 Billion	500	350	12″–14″	125 Mi.	15,000,000
				675 Billion	495 Billion					135,000,000

Fields not Marketed—Billy Creek, Lance Creek., Enos Creek Exhausted Fields—Golden Eagle.

California Gasoline Men Elect *for* Year Ahead

At the meeting of June 16 of the California Natural Gasoline Association, Geo. L. Ratcliffe of the General Petroleum Corporation was elected president for the year ahead. I. B. Funk is now vice-president of the organization, and Paul Barton, who piloted the association thus far as president, is now secretary-treasurer.

There were three places on the directorate of the association which expired, R. E. Beckley and H. W. Parmalee being reelected for a two-year term, and the place vacated by Mr. Ratcliffe being filled by J. S. Watson, former secretary.

At the meeting there were given six short papers reporting on phases of the May convention of the Association of Natural Gasoline Manufacturers, H. W. Parmalee reported in general on the convention; I. B. Funk spoke on outstanding differences in practice in the Mid-Continent and California natural gasoline industries; Geo. Ratcliffe summarized the research report given at the convention by Dr. G. G. Brown of the department of engineering resaerch, University of Michigan, who was retained by the Association of Natural Gasoline Manufacturers to make a motor fuel study. (Incidentally, Dr. Brown will probably soon come to Los Angeles for a joint meeting of the California Natural Gasoline Association and the Association of Natural Gasoline Manufacturers). A. M. Porter offered a report on the stabilization of gasoline; J. M. Hicks covered the Seminole fields; and H. S. Cole, Jr., the development of the Amarillo-Panhandle field.

Paul Barton gave an address as retiring president of the organization, and another paper, "Welding as Applied to Gasoline Plants" was presented by J. E. Kobernick of the Newton Process Company.

DERIVATIVES FROM NATURAL GAS GASOLINE

The Sharples Solvent Corporation is understood to be commencing commercial development of its process for manufacture of organic solvents from natural gas gasoline, in Charlestown, W. Va. By the company's process are produced pentasol, which is practically pure amyl alcohol, and pentacetate, the acetic acid derivative. Any grade of natural gas gasoline serves as the principal raw material.

TEXAS COMPANY CONSTRUCTING TWO LOUISIANA PLANTS

The Texas Company recently started construction on two natural gasoline absorption plants in the Louisiana fields, including a high pressure absorption plant to be constructed in the Cotton Valley field. The gas to be handled by the Cotton Valley plant offers a yield of about one-half gallon of gasoline per thousand cubic feet, and the plant is to be equipped to handle in excess of ten million cubic feet daily. The second plant is to be built at Mansfield, where a small amount of rich gas is available on the company's leases. The latter plant will be equipped to handle about one million cubic feet of gas daily with a recovery of four gallons per thousand cubic feet.

ALAMITOS ADDITION

Four 85-H.P. Cooper compressor units have been added to the Alamitos Heights plant of the Getty Oil Company.

Summary *of* Natural Gas Gasoline *in* California *for* 1926

By E. T. KNUDSEN *and* J. W. MASHAW

THE following statistical summary of the natural gas gasoline industry's record in California for the year 1926 is taken from the 1927 report of E. T. Knudsen and J. W. Mashaw of the San Francisco office, Bureau of Mines, Department of Commerce, which report was released late in May.

Daily average production of natural gas gasoline increased from 22,231 barrels in January to 30,549 barrels in December. Recoveries per thousand cubic feet of gas treated increased from 1.309 gallons in January to 1.419 gallons in December. Consumption of natural-gas gasoline for the year amounted to 9,040,350 barrels, of which 3,296,518 barrels or 36.46 per cent was mixed with crude or unfinished oils and run to stills; 4,689,610 barrels or 51.88 per cent blended at refineries and 1,054,222 or 11.66 per cent used at natural-gas gasoline plants and losses. Average daily consumption for the year was 24,768 barrels or 631 barrels less than daily average production. Stocks of natural-gas gasoline at the beginning of the year amounted to 64,599 barrels, less than three days supply at the then rate of consumption. At the end of the year stocks showed an increase of 253,753 barrels and amounted to 318,352 barrels, about eleven days supply at the current rate of consumption. The following table shows the operating status of the plants in the state:

Months	Plants in California	Inactive	Operating	Included in this report
January	166	19	147	147
February	166	21	145	145
March	164	19	145	145
April	162	15	147	147
May	161	15	146	146
June	160	19	141	141
July	162	13	149	149
August	158	12	146	146
September	158	13	145	145
October	164	19	145	145
November	166	20	146	146
December	169	20	149	149

Average Daily Production and Utilization of Natural-Gas Gasoline—1926

Months	*Average Daily Production (Barrels)*	*Average Daily Utilization (Barrels)*	*PERCENTAGES Mixed With Crude*	*Blended at Refineries*	*Used at Plants and Losses*
January	22,231	20,445	39.22	61.43	* .65
February	23,015	24,128	33.81	45.12	21.07
March	23,518	23,792	34.89	55.63	9.48
April	23,232	19,689	43.25	65.23	* 8.48
May	24,008	24,396	36.87	50.85	12.28
June	24,858	25,201	37.30	44.94	17.76
July	25,457	24,642	37.81	36.28	25.91
August	25,416	23,371	37.44	54.15	8.41
September	26,022	25,295	34.94	43.50	21.56
October	27,464	28,306	33.13	62.25	4.62
November	28,831	28,403	34.58	53.46	11.96
December	30,549	29,471	36.71	51.90	11.39
TOTAL	25,399	24,768	36.46	51.88	11.66

*These figures represent a theoretical gain.

Production and Stocks of Gasoline of Natural-Gas Gasoline Plant Operators—1926, and Total Stocks of Natural-Gas Gasoline—1926—(Barrels)

Month	*Finished Gasoline (Motor Fuel)* **Production	***Stocks	*Stocks of Natural-Gas Gasoline* Held by Plant Operators	Held by Refiners	TOTAL	Inc. or Decrease
December 31, 1925	.....	227	15,954	48,645	64,599	.....
January 31, 1926	5,795	538	21,263	98,711	119,974	55,375
February 28	4,286	723	20,358	68,446	88,804	*31,170
March 31	5,545	227	21,655	60,231	81,886	* 6,918
April 30	4,957	461	21,646	184,071	205,717	123,831
May 31	5,211	512	27,021	171,040	198,061	* 7,656
June 30	5,105	463	25,870	161,896	187,766	*10,295
July 31	5,102	621	20,291	192,741	213,032	25,266
August 31	4,974	576	35,055	241,370	276,425	63,393
September 30	4,411	200	29,345	268,874	298,219	21,794
October 31	4,443	123	34,043	238,076	273,119	*26,100
November 30	4,318	194	32,422	252,527	284,949	12,830
December 31	4,324	170	33,672	284,680	318,352	33,403
TOTAL	58,471	.....	.....	.....	.....	253,753

*Decrease

SUPERBO
AUTOMATIC
STORAGE
WATER HEATERS

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A Full Line
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No. 2—30 gallons. . . 125.00
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No. 4—66 gallons. . . 250.00

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No. 24—18 gallons. . $ 75.00
No. 32—26 gallons. . 85.00
No. 50—40 gallons. . 135.00
No. 60—52 gallons. . 185.00

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No. 18—18 gallons. . . $55.00
No. 26—26 gallons. . . 65.00
No. 35—35 gallons. . . 95.00

Superbo "Multi-cell"

Four sizes. Suitable for large residences, apartments or hotels.

Heaters used in connection with large storage tanks of 100-1000 gallons capacity.

Prices and specifications on application

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All prices F. O. B. Factory

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Manufactured by

Superbo Mfg. Co.
Los Angeles California

Natural-Gas Gasoline Utilization—1926—(Barrels)

Month	*Production*	*Imports*	*Increase or Decrease in Stocks*	*Total Indicated Utilization*	*Mixed With Crude*	*Blended at Refineries*	*Used at Plants and Losses*
January	689,162	.....	55,375	633,787	248,544	389,352	** 4,109
February	644,414	.....	* 31,170	675,584	228,429	304,824	142,331
March	729,061	1,560	* 6,918	737,539	257,335	410,318	69,886
April	696,966	17,545	123,831	590,680	255,482	385,328	** 50,130
May	744,236	4,371	* 7,656	756,263	278,808	384,535	92,920
June	745,740	.....	* 10,295	756,035	282,026	339,766	134,243
July	789,178	.....	25,266	763,912	288,811	277,129	197,927
August	787,906	.....	63,393	724,513	271,263	393,287	60,963
September	780,656	.....	21,794	758,862	265,104	330,120	163,638
October	851,378	.....	* 26,100	877,478	290,698	546,235	40,545
November	864,922	.....	12,830	852,092	294,629	455,536	101,927
December	947,008	.....	33,403	913,605	335,389	474,180	104,036
TOTAL	9,270,627	23,476	253,753	9,040,350	3,296,518	4,689,610	1,054,222

* Decrease.

** These figures represent a theoretical gain.

Natural-Gas Gasoline Recoveries—1926—(In Gallons per 1000 Cubic Feet of Natural Gas Treated)

BY METHODS

Month	*Oil Absorption*	*Compressor*	*Combination Compressor and Oil Absorption*	*Combination Oil and Charcoal Absorption*	*Charcoal Absoprtion*	*TOTAL*
January	1.315	1.374	1.310	1.691	.194	1.306
February	1.403	1.379	1.338	1.661	.217	1.349
March	1.459	.960	1.408	1.693	.148	1.384
April	1.384	1.248	1.369	1.734	.096	1.343
May	1.382	1.614	1.456	1.680	.087	1.363
June	1.430	1.584	1.462	1.627	.051	1.369
July	1.436	1.688	1.478	1.600	.094	1.394
August	1.372	1.397	1.549	1.522	.151	1.398
September	1.398	1.628	1.563	1.034	.045	1.315
October	1.432	1.660	1.581	1.210	.178	1.393
November	1.486	1.682	1.581	1.099	.103	1.380
December	1.527	1.688	1.611	1.115	.196	1.419
YEARLY	1.421	1.464	1.479	1.378	.124	1.369

Natural Gas Gasoline Production—1926—(Gallons)

BY METHODS

Month	*Oil Absorption*	*Compressor*	*Combination Compressor and Oil Absorption*	*Combination Oil and and Charcoal Absorption*	*Charcoal Absorption*	*Drip*	*Total*
January	13,112,022	499,393	10,921,569	4,189,223	195,632	26,952	28,944,791
February	13,642,849	453,371	9,083,024	3,640,925	222,463	22,779	27,065,411
March	15,440,198	516,535	10,567,740	3,896,420	177,541	22,142	30,620,576
April	13,836,001	368,396	11,076,054	3,863,077	113,809	15,247	29,272,584
May	15,073,636	517,363	11,283,318	4,247,523	125,008	11,084	31,257,932
June	14,905,082	495,437	11,607,600	4,222,839	82,415	7,700	31,321,073
July	15,598,256	542,604	12,248,426	4,616,123	133,083	6,990	33,145,482
August	15,582,603	297,588	12,408,145	4,638,420	158,013	7,271	33,092,040
September	14,727,781	515,111	12,543,624	4,934,613	57,925	8,482	32,787,536
October	15,695,609	533,505	13,636,646	5,691,192	189,758	11,163	35,757,873
November	16,911,443	518,098	12,834,094	5,936,129	114,147	12,807	36,326,718
December	18,947,426	543,738	13,817,616	6,218,113	226,219	21,209	39,774,321
TOTAL	183,472,906	5,801,139	142,027,856	56,094,597	1,796,013	173,826	389,366,337

Natural Gas Treated—1926—(Thousand Cubic Feet)

BY METHODS

Month	*Oil Absorption*	*Compressor*	*Combination Compressor and Oil Absorption*	*Combination Oil and Charcoal Absorption*	*Charcoal Absorption*	*Total*
January	9,972,345	363,428	8,336,304	2,477,084	1,006,257	22,155,418
February	9,727,003	328,665	6,786,784	2,191,444	1,026,721	20,060,617
March	10,583,129	537,915	7,505,060	2,300,922	1,199,186	22,126,212
April	9,998,861	295,111	8,092,181	2,227,452	1,185,825	21,799,430
May	10,904,754	320,467	7,751,270	2,528,302	1,429,801	22,934,594
June	10,422,688	312,822	7,940,397	2,595,056	1,605,490	22,876,453
July	10,860,915	321,478	8,289,766	2,884,637	1,416,518	23,773,314
August	11,356,539	212,951	8,011,276	3,048,316	1,046,815	23,675,897
September	10,532,112	316,351	8,023,822	4,773,793	1,284,349	24,930,427
October	10,960,885	321,299	8,626,825	4,702,558	1,063,580	25,675,147
November	11,383,547	308,194	8,116,876	5,402,530	1,106,587	26,317,734
December	12,406,172	322,188	8,579,105	5,575,246	1,156,819	28,039,530
TOTALS	129,108,950	3,960,869	96,059,666	40,707,340	14,527,948	284,364,773

25 PANHANDLE PLANTS TREAT 648 MILLION CU. FT. DAILY

THE 25 natural gasoline plants in the Panhandle area of Texas, all of which are of the absorption type, are treating the large volume of 648,000,000 cubic feet of natural gas each day, according to a recent survey of the district. The plants are recovering better than one and one-fourth gallons of natural gasoline from each thousand cubic feet treated. Total recovery during the month of May was 8,765,-069 gallons.

The areas, number of plants in each, volume of gas treated and gasoline recovered, are as follows:

Area (County)	*No. Plants*	*Million cu. ft.*	*Gallons Gasoline*
Hutchinson	14	433–	6,823,975
Carson	3	88–	829,115
Wheeler	2	50–	143,828
Gray	5	47–	923,091
Potter	1	30–	45,000

In addition the Western Carbon Black Company's plant south of Borger, and one of the largest carbon black plants in the Mid-Continent area, burns 200,000,000 cubic feet of gas daily.

The remaining 450,000,000 cubic feet of dry gas is available for use in natural gas distribution systems, a number of which are now being built to utilize gas from the Amarillo-Panhandle fields.

BUILD HIGH PRESSURE PLANT IN COTTON VALLEY, LA., FIELD

The Louisiana Oil & Refining Corporation has contracted for a quantity of natural gas in the Cotton Valley field from the Woodley Petroleum Company, and will build a high pressure absorption plant to handle about 10,000,000 cubic feet of gas daily. This gas offers a yield of about one-half gallon per thousand cubic feet. A plant formerly used in connection with the crude oil refinery at Shreveport is being dismantled and moved to the Cotton Valley location, and only a small amount of new equipment will be needed to again put it in operation.

PUBLISH MOTOR FUEL BOOK BY G. G. BROWN

The Department of Engineering Research of the University of Michigan has published Dr. G. G. Brown's work on the relation of fuel characteristics to engine performance in booklet form and these are available from the University of Michigan at Ann Arbor for $1.00. The booklet is a summary of all work done in connection with the research program of the Association of Natural Gasoline Manufacturers, and includes the basis of Dr. Brown's speech before the association's annual meeting on May 25.

BEGIN GASOLINE PLANT

Construction work has been started on a high pressure absorption gasoline plant by the Moody Corporation and H. H. Adams on the J. C. Dyer pool discovery lease in northwestern Eastland County, Texas.

LITTLE FLOOD DAMAGE TO MONROE FIELD PLANTS

Natural gasoline and carbon black plants in the Monroe field in Louisiana are back on a normal production basis again after the floods. The high waters did little damage to this field because backwaters from the Mississippi were not as serious as in many other parts of the state.

ADD TO STANDARD PLANT

Standard Gasoline Company's No. 8 Huntington Beach plant has added five 170-H.P. Cooper units to its equipment.

At Home With the Movie Stars

A Short Talk to Gas Company Executives

PAYNE GAS FIRED WARM AIR FURNACE HEATING is a big favorite with the movie stars. To give you some idea of how they enjoy this type of heating for their homes we have prepared an interesting booklet entitled "At Home with Movie Stars." This 32-page booklet is generously illustrated. It shows photos of many of the movie stars' homes, the photographs of the stars themselves, diagrams of the PAYNE system of gas furnace installation and much valuable information which is applicable to your heating problems.

An illustration from "At Home with the Movie Stars," the interesting little booklet which we will send to you FREE.

Dictate a request for as many copies as you need for your sales department.

PAYNE FURNACE & SUPPLY CO. INC.

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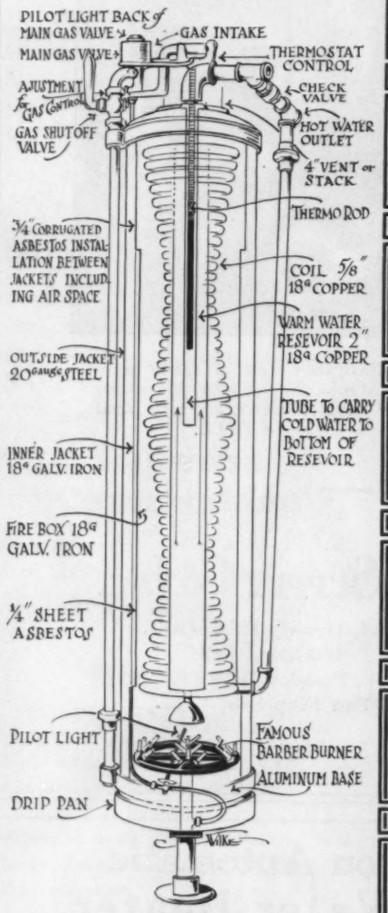
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IMMENSE PROGRAM ON FOR EMPIRE COMPANIES

The Empire Companies Natural Gas Division, and affiliated companies have under way one of the largest expansion programs ever announced for a gas utility system, involving the expenditure of about $20,000,000 in the year ahead, and bringing increased gas supplies and better facilities for service throughout the affiliated company's properties in Oklahoma, Kansas and Missouri. Chief item on the list, of course, is the line from Texas fields to Wichita, described elsewhere in this issue. A current issue of the Empire Company publication announces other improvements as follows:

"The Empire is spending a total of $5,000,000 on the enlargement of pipeline and compression facilities on their already existing main line; the extension into (1) Davenport-Lindley-Depew field, (2) the Drumright-Cleveland 'loop,' (3) the enlargement of the Petrolia compressor station near Chanute on the Kansas City twin 16-inch line, (4) the building of the Craig compressor station near Kansas City, (5) the Otstot compressor station near Blackwell, (6) the Bristow compressor station, (7) the extension into the Seminole, Beardon and Earlsboro fields, (8) an enlargement of the Tallant compressor station near Barnsdall, Okla., the building of (9) the Winfield compressor station and (10) the Eastman compressor."

VANCE LEAVES PAYNE CO. TO TAKE BRAASCH MANAGERSHIP

J. Lyle Vance, for the past four years sales and advertising manager of the Payne Furnace and Supply Company of Beverly Hills, Calif., has resigned his position with that company to become general manager of the A. J. Braasch Heater Company of Hollywood, Calif. His appointment to that post becomes effective July 1.

EXTEND VICTORIA MAINS

Gas mains of the B. C. Electric company system at Victoria are to be extended to the Foul bay area, with a five to six mile 8-inch, 6-inch and 4-inch high pressure line.

SEGUIN, TEX., CONTRACTS WITH SOUTHERN GAS COMPANY

The city council of Seguin, Tex., has granted a 30-year franchise to the Southern Gas Company of San Antonio to furnish gas to Seguin for domestic purposes. The company is given four months to begin actual installation of pipe lines in the city, and they have posted a sum of $10,000 to complete the work according to contract.

ST. LOUIS, OKLA. CONSIDERING GAS SERVICE

St. Louis, Okla., may have natural gas for the first time if the Independent Gas Company and the town officials can reach an agreement. The pipeline of the Independent company runs a half mile north of the town.

JONES IS CITIES SERVICE V. P.

The election as first vice-president of the Cities Service Co. of William A. Jones, who for the last two years has been chairman of the executive committee of Henry L. Doherty & Co. was announced on June 15 at the offices of the latter company.

GRIEBEL CHOOSES JENSEN

The Griebel Instrument Company, manufacturer of physical and chemical laboratory glassware and apparatus, has chosen the Jensen Instrument Company as exclusive Pacific Coast agents.

MEMBER COMPANIES CAN TIE IN WITH NATIONAL ADS

With its 1927 industrial advertising campaign under way in a list of 27 national trade media, the American Gas Association is again making it possible for individual gas companies to establish a local tie-in with the series of national messages. The national advertisements are being reproduced in the form of newspaper mats, to be used over the local gas companies' signatures, and a mat service covering a six-month period has been made available to the A. G. A. membership. Mats may be had either in three or five-column width and may be ordered by mail from the American Gas Association.

FRANK WEISS RETURNS TO WORK AFTER ILLNESS

Frank Weiss, manager of new business for the Los Angeles Gas & Electric Corp., is back in the traces after a three-week illness. He returned just in the nick of time to put the finishing touches to the company's pre-election campaign against municipal ownership of its electric system.

NEW EDIFICE FOR LOS ANGELES HOME FURNISHING CONCERN

Parmalee-Dohrman Company of Los Angeles, retailers of household supplies, including various lines of gas ranges, in June opened its new height-limit store at 741-747 South Flower Street.

HEATING, COOKING APPLIANCE MEN TO SIMPLIFY

At its convention in New York City on May 11, 1927, the National Association of Manufacturers of Heating and Cooking Appliances adopted a resolution which empowered their simplified practice committee to proceed with drafting a simplified practice recommendation to go through the regular procedure of the Department of Commerce.

STANDARD GAS EQUIPMENT HAS QUARTERLY MEETING

On June 13 and 14 the Standard Gas Equipment Corporation held a "management meeting" at Baltimore, Md. These meetings are held quarterly, and are attended by the executives and key men from the sales, advertising and manufacturing departments.

GANT INTERESTS GET PERMIT TO SERVE 4 OKLAHOMA TOWNS

Four more Oklahoma towns have been added to the long list of municipalities that have granted franchises to gas distribution companies within the past few months. Pauls Valley, Purcell, Sulphur and Davis on June 21 granted gas franchises to Walter H. Gant and associates of Oklahoma City. Franchises were granted in each town by a large majority. Service is to be given within ninety days after receiving the franchises.

BLAIR NOW HAS NATURAL GAS

The gas distribution system installed at Blair, Okla., by the Southwestern Light & Power Company was put into operation June 10.

SOUTHERN PACIFIC SHOPS NOW GAS USER

Los Angeles Gas & Electric Corp. has added the Southern Pacific Railway shops to its list of industrial users, and is distributing from one to two million cubic feet daily to the new consumer.

LOUISIANA LINE TO SUPPLY NEEDS OF PULP MILL

Another pipe line outlet for the surplus gas production in the Monroe, La., field is to be provided by Hodges & Casey, who have headquarters at Ruston, La., and the gas will be used to supply the fuel requirements of a pulp mill. New England interests have acquired a large amount of timber south of Ruston and will erect a paper manufacturing plant. The line for gas delivery is being built by Hodges & Casey and will require about 45 miles of pipe, which is to be seven-inch welded. Well pressure is sufficient to boost the gas through the line to the plant and deliveries are expected to run in excess of 5,000,000 cubic feet daily.

FOURTH PHILLIPS PETROLEUM PLANT IN YOUNG COUNTY

Phillips Petroleum Company has started construction work on a natural gasoline plant to handle the heavy volume of gas furnished by 3900 foot oil producers in the Stoval-McCluskey section of the South Bend field, Young County. The plant is being erected on the E. C Stovall farm to handle 15,000,000 cubic feet of gas daily through the charcoal process. The gas in this area averages about one gallon of gasoline per thousand cubic feet with a substantial gain in yield when the gas pressure recedes. This new plant will be the fourth for Phillips Petroleum Company in the county.

P. G. AND E. LAYS MAINS

The Pacific Gas and Electric Company is laying 10 miles of gas main to connect Gridley, Calif., with its system. The Libby, McNeill cannery just south of Gridley has already been connected with the company's Marysville-Oroville transmission line. Roseville, which also recently gave the P. G. and E. a franchise for gas service, will get gas shortly.

PIPE FIRM ELECTS

A. W. Campbell, formerly president of the American Seamless Tube Corporation, was elected chairman of the board at a recent meeting of company stockholders in Los Angeles. A. J. Carr, formerly vice-president, is now President, F. L. Fiesthamel, first vice-president, and J. A. McNamara of New York treasurer. C. A. Riley, former auditor, is secretary.

SEARS-ROEBUCK L. A. HOME IS GAS OUTFITTED

Gas fuel is being used for heating, cooking, for high pressure boilers, and emergency lighting, in the new 13-story building erected by Sears-Roebuck company in Los Angeles. The new structure, which is on the lines of the Southern California Gas Company, is of the "set-back" style of architecture, and presents a very impressive appearance on the city's eastern skyline.

NEW BUILDING

Wyandotte County Gas Company has under way a two-story office building at 820-22 Minnesota Avenue, Kansas City, Kan.

NATURAL GAS IN DALLAS

Natural gas was turned into the mains of Dallas, Texas, about June 15, as a result of Magnolia Gas Company's completion of its welded pipeline from Northeast Texas.

LULING GIVES FRANCHISE

Luling, Texas, has given a 30-year natural gas franchise to the Southwest Gas Company.

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Oxide Purifying Material Equipment
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The "MINNEAPOLIS"
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The heart of the heating plant

Minneapolis is the proven control. National advertising makes it easy to sell. You are giving your customer the best there is and making additional profit for yourself. This means more satisfaction all around.

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Salesmanship *of* Industrial Gas

By W. F. SUESS
Southern California Gas Company

¶ Just what is demanded of the salesman of industrial gas? A general answer will be found in this brief discussion, read at the commercial session of the P. C. G. A. in February.

GAS companies in the past few years have made detailed surveys to classify industrial concerns as to the possibility of replacing competitive fuels based on relative costs of manufacturing their commodity using gas as compared with other fuels.

The conclusion we all came to was that gas can be applied to all processes requiring heat. Since the cost of manufactured gas cannot compete with the natural fuels on a direct B. t. u. cost comparison, the comparative costs cannot be used to sell our commodity. The cost of the fuel is not the proper basis of attacking our problem. Our problem evolves itself into one of relative cost of manufacture for the finished commodity. The inherent factors of dependability, flexibility, ease of handling, and results obtainable, make it possible for the gas engineers to make gas supreme in the field of the application of heat.

The work of the industrial sales department divides itself into the securing of new business in plants now using gas and other fuels, selling new industries completely on the use of gas, that of holding the business we now have, and the converting of plants not using gas.

Securing New Business in Plants Now Using Gas. The securing of new business in plants now using gas requires research. The customer is fully acquainted with many of the applications of gas. Frequent visits by the sales engineer who takes a personal interest in serving the customer will obtain his confidence. Obtaining his confidence and making him feel that he is solving his own problem, and that you are merely assisting him, will aid in closing the sale. Operating cost maintenance, depreciation and the desired quality of the article manufactured is information which must come from the customer and is of more or less confidential nature but necessary as a gage below which the proposed new gas equipment must fall.

NEW INDUSTRIES EASIER

Selling New Industries. New industries offer less sales resistance than old industries that have made a decision. By reaching industrials while the design of their plant is in an embryo stage the gas engineer is able to furnish them with irrefutable proof of past performance of gas in similar plants, sell him on gas and on his company and effectively close the door to competitive salesmen. Once a decision has been reached by a customer he seldom changes. This very human trait in a man is the key that locks the door to competitive salesmen, and will raise a barricade to the gas salesman if he is not there first. Sales that are made after the customer has decided on a competitive fuel are made only after submitting overwhelming proof of the superiority of gas for fuel and as a rule leave the customer disposed to be rather unfriendly toward the company, which requires diplomatic handling and the rendering of 100 per cent service to overcome.

The satisfactory operation of new equipment is dependent on the installation of house lines of sufficient size, proper regulators, and a correct adjustment. The men who are to operate the appliances must be trained carefully in the proper manner of operation. It is important that the work of installing this equipment be planned and timed so that it will not interfere or delay other work. Perfect coordination of effort between the industrial sales department and the operating department is necessary to effect this on the company's part.

The operating engineer who is to be responsible for a good installation and for servicing the equipment in the future is present at the close of the sale as a consultant and assumes the responsibility of planning the work.

Holding the Business We Now Have. The two factors in holding the business we now have are service and the diplomatic handling of our customers at peak loads when it is necessary to discontinue their service in favor of commercial and domestic customers.

To render service to industrial customers it is necessary to have highly trained specialists to diagnose their trouble and effect a cure. There are probably in excess of two thousand applications of gas for heat in the industries. It naturally follows that trained specialists in certain phases of the application of heat to certain classes of this business are essential.

DISCONTINUING SERVICE A PROBLEM

Discontinuance of service at peak load times is a problem which will always face the gas companies. The favorable rate for gas which we are able to give industrial customers is dependent on an off peak load. Proper rate structure will only partially solve this problem. A big factor in its solution remains with the industrial sales department. The securing of the cooperation of the various industries to use gas at off peak times is part of their work.

The first impressions and ideas received by the customer are of utmost importance to the retaining of his good will and patronage.

An old Judge friend of mine once said, "All business is done on a lying basis." By that he meant that in selling we give all the good points, which does not enable the customer to arrive at the truth. As sales engineers it is our duty to be sure that the customer has a true full knowledge of what we have to sell and the terms and conditions connected with its sale. Securing his confidence in this matter it is not difficult to have him equipped with other fuel for emergencies, and so hold his patronage after the peak is past.

The sales engineer should be the company representative to advise the customers to discontinue the use of gas at peak load times. Discontinuance of service by any other means will react unfavorably to the company.

Converting of Plants not now Using Gas. One of two conditions generally prevail in industrials that are not using gas; either they have not been sold on the advantages of converting to gas or due to some complex twist of the mind of someone at the head of the concern gas is "tabooed." The first can be solved by a careful study of their business and the submitting of conclusive proof of the advantage of gas over other fuels.

An intimate knowledge of the history of

the concern and the men at the head is necessary to solve the last. Before progress can be made it is necessary to remove or overcome the objection of the man or men who are unfavorable to gas. This emphasizes the human element in the making of a sale and requires that the sales engineer not only be highly technical and sure of his points, but also be a diplomat and something of a polititian.

In conclusion it may be said that while the desirability of industrial gas sales has been generally accepted, and various ways and means to obtain this business have been evolved, yet the cornerstone of this business is the human factor, the sales organization and personnel necessary to accomplish this Herculean task. The answer to this remains with the managements of the gas companies.

1700 MILES OF MAIN FOR COKE GAS IN GERMANY

A gas distribution system having 1,700 miles of mains is to be constructed in Germany to carry gas from the coke plants of the Ruhr district to various parts of the country.

Nearly five hundred billion cubic feet of gas is produced yearly by these plants, and will be made available by the projected system of mains to Berlin, Leipzic, Munich, Cologne, Manneheim, Stuttgart and other cities.

The longest single main will be that from Ruhr to Berlin, a distance of 285 miles.

DEARBORN CHEMICAL PLANT IN LOS ANGELES

The new plant which the Dearborn Chemical Company is erecting at 807-815 Mateo St., Los Angeles, will be ready for occupancy around the 1st of August, according to A. B. Burns, Pacific Coast manager. The plant is costing approximately $150,000 and will house considerable new equipment. The company, with its main headquarters in the east, manufactures Dearborn Boiler Feed Water Treatment and also No-Ox-Id, rust preventative.

SHIP BENZOL BY TANKER TO EASTERN BUYER

Tank steamer shipment of benzol is the latest venture being engaged in by the Portland Gas & Coke Company. Some 300,000 gallons of benzol will be shipped to an eastern purchaser early in July. A pump handling 1000 gallons a minute, and a 1300-foot six-inch line to the loading dock are being installed, while the company's light oil plant works at full capacity to turn out the order, for temporary storage on gas company premises.

ALLOYS CO. SAMPLING

The Alloys Company, with headquarters in San Francisco, has under way a campaign of sampling companies in the gas and oil industries, with its powered metallic lead compound for use in securing leak-proof pipe joints. According to the manufacturers, their compound is insoluble in acid, gas, oil or gasoline, and also has the quality of increasing in volume on heating.

STANDARD LABORATORIES ARE NOW INSPECTED

Standard Gasoline Company, which for the past five years has followed a practice of monthly inspection of its individual gasoline plants, has extended the inspection system to its five southern division laboratories. The laboratories are now rated for their relative standing each month.

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Gas Engines *and* Compressors

(Continued from Page 46)

Isothermal compression being the theoretical extreme opposite to adiabatic, assumes that all of the heat of compression is removed from the gas during compression and no rise in temperature is experienced. Under practical conditions an actual compressor indicator card will conform to neither of these extremes, but will lie somewhere between the two. Numerous investigations, however, seem to indicate that the average actual compression curve will approximate the adiabatic more closely and for all practical purposes this curve may be used for calculation.

Compression ratio (R) equals absolute discharge pressure (P_2) (gauge+14.7lb) divided by absolute suction pressure (P_1).

Volumetric efficiency (VE) expressed in per cent is the ratio between the actual gas or air delivered by a compressor and its piston displacement in the same unit of time. This quantity may actually vary under practical conditions from as high as ninety or even ninety-five per cent to as low as thirty-five or forty under extreme conditions. Its value depends upon the compression ratio and the compressor clearance, and will also depend on whether the compression is adiabatic, isothermal or between these two extremes.

Mechanical efficiency (ME) accounts for the loss of power due to piston and rod friction.

Compression efficiency (CE) accounts for power lost in forcing gas through the valves and in and out of the compressor.

Exponent "n":—the ratio of the specific heat at constant pressure to the specific heat at constant volume of the gas compressed. For dry natural gas "n"=1,265; for wet casinghead gas and air "n"=1.406, although a great many manufacturers assume 1.265 or 1.3 as the value of "n" for all natural gas, wet or dry.

An expression or formula for the indicated horsepower (I.H.P.) may be derived from an analysis of the theoretical adiabatic compressor indicator card. The actual derivation is omitted here but the formula resulting is:

$$\text{I. H. P.}=PD\times P_1\times\frac{144n}{33{,}000\ (n-1)}\left(R^{\left(\frac{n-1}{n}\right)}-1\right)\left(1-C1\%\ [R^{\frac{1}{n}}-1]\right)$$

If therefore a given compressor cylinder is assumed and the values of PD, P_1, R, C1% and "n" be substituted in the formula, a value for the I.H.P. required by the given compressor under the specified pressures may be arrived at.

The logarithmic computations necessary in solving the above equation, however, are somewhat involved and to facilitate the use of the formula it may be separated into its factors and curves plotted for each throughout a wide range of values for the variables in each factor.

The quantity

$$\frac{PD\times144\times n}{33{,}000(n-1)}\left(R^{\left(\frac{n-1}{n}\right)}-1\right)$$

may be taken separately and represented by "K." If "n" is given a value and PD is taken for convenience as 100 cubic feet per minute, there remains but one variable—R, and a curve may be plotted for a range of values of R against corresponding values for the entire expression "K." On Supplementary sheet "A," values of this expression "K" are plotted against corresponding values of R, one curve for each of the two values of "n."

The quantity

$$(1-C1\%\ [R^{\frac{1}{n}}-1])$$

is the volumetric efficiency and contains two variables, C1% and R. This quantity can be expressed graphically by a series of curves one for each of a number of different values of C1% all plotted against R or a simpler arrangement is that of the alignment chart shown on Supplementary sheet "B." The volumetric efficiency is determined from the center scale by laying a straight edge between the values of R and C1%.

The equation is then greatly simplified and becomes

$$IHP=\frac{PD}{100}\times P_1\times K\times VE$$

$$\text{or } BHP=\frac{IHP}{ME\times CE}=\frac{PD\times P_1\times K\times VE}{100\times.95\times.90}$$

By a similar analysis of the adiabatic card, the formula for the theoretical capacity of the compressor (single stage) is found to be

$$\text{Capacity}=\frac{T_M}{P_M}\times\frac{T_1}{T_1}P_1\times PD[1-C1\%(R^{\frac{1}{n}}-1)]$$

where—

T_M=absolute standard measuring temperature (usually 60°F+460).

P_M=absolute standard measuring pressure (14.7 lbs. at sea level).

P_1=absolute suction pressure (lbs. per square inch).

T_1=absolute suction temperature (°F.+460).

PD=piston displacement.

$[1-C1\%(R^{\frac{1}{n}}-1)]$=volumetric efficiency as above.

Assuming for all practical purposes T_M and T_1 are equal, the simplified equation is

$$\text{Capacity}=PD\times\frac{P_1}{14.7}\times VE$$

This is the maximum theoretical adiabatic capacity of the compressor, but in modern plate valve compressors with efficiency jacket cooling this equation should be multiplied by a factor which takes care of the deviation of the actual compression line from the theoretical adiabatic. This factor will range from .98 to .75 depending on the compression ratio in each specific case.

An example typical of most natural gasoline plants may be worked out as follows:

Given pressure conditions 0 pounds gauge suction to 30 pounds gauge discharge. Assume one 17″ diameter by 20″ stroke double-acting compressor, operating at 200 R.P.M. with a total clearance of 5% of the displacement.

By calculation PD=1041 cubic feet per minute.

$$\text{Compression ratio } R=\frac{30+14.7}{0+14.7}=3.04.$$

From sheet A, K=.57 (n=1.406).

From sheet B, VE=.929.

$$\text{B.H.P. required}=\frac{1041\times14.7\times.57\times.929}{100\times.90\times.95}=95.$$

$$\text{Theoretical capacity per 24 hours}=1041\times1440\times\frac{14.7}{14.7}\times929=1{,}392{,}000 \text{ cu. ft.}$$

Actual capacity (maximum)=1,392,000×.98=1,364,000 cu. ft. per 24 hrs.

$$\text{B. H. P. required per million cubic feet. actual}=\frac{95}{1.364}=69.6.$$

If a clearance in the compressor of 10% is assumed, the only change is in the volumetric efficiency VE which now equals 85.8% instead of 92.9% with 5% clearance. The B.H.P. required then by the compressor is 87.8 and the actual daily capacity is 1,260,000.

The B. H. P. required per million cubic feet actual capacity is still $\frac{87.8}{1.260}$ or 69.6, the same as with 5% clearance in the compressor. Thus it can be seen that although increased clearance in a compressor decreases its actual capacity, the horsepower required also decreases in the same proportion.

In conclusion the writer submits the premise that the solution to any compressor problem may be found by the application of these basic formulae.

The Revocable Permit

(Continued from Page 38)

The securing of capital represented by this expansion of utility service properties has been greatly facilitated and reduced in cost by the fact that under the new law in Oklahoma utility companies are not facing early or definite expiration of their right to operate,—that no longer are companies seeking to market securities based on Oklahoma utility properties which are confronted with expiration of their right to operate in certain towns involved prior to maturity of the securities offered.

Due to this more favorable condition large purchasers of utility securities, not previously in the market for those of Oklahoma, now accept them, readily, and others, previously discounting Oklahoma securities materially, now accept them as equal in desirability to those of states formerly having a substantial advantage over Oklahoma. As such discounts are a necessary charge to operation, their elimination, made possible by the revocable permit law, is a direct benefit to the customers of companies doing new financing or refinancing.

The revocable permit law provides for revocation of the permit by the state legislature for cause. However, a more speedy and certain "recall" of a franchise of any character exists if the utility company holding it forfeits public favor. Section 6 of Article 18 of the Constitution empowers municipalities to engage in any business which they may authorize by franchise. Citizens dissatisfied with a public utility company may put their municipality into competition with it and thus force it out of the field. This has been done in one city in Oklahoma since the revocable permit law

was adopted. That the new form of permit is not only thus subject to speedy revocation but also is not exclusive, against the will of the citizens, has been proven in another town of the state where an applicant for a competing franchise secured permission to ask the citizens for the right to operate. The two companies are in litigation but the revocable permit law is not now standing in the way of a second franchise.

A few, while acknowledging the merits of the revocable permit law, have, as already stated, questioned its validity in view of Section 5, Article 18 of the Constitution, which prohibits municipal corporations from granting or renewing franchises except by approval of the citizens, or for a term exceeding 25 years. Lawyers who have studied this question hold that this constitutional provision restricts municipalities only, and not the legislature, in dealing with this subject and point to Section 36 of Article 5, which states that any specific grant of authority in the Constitution upon any subject shall not work a restriction or limitation upon the legislature as to such subject. This question is now before the supreme court.

Those studying most carefully the effect of this measure already see as one of its most dsirable results a better working relationship between utilities and the communities served by them. By doing away with necessity for regular renewal of franchises, this legislation has released for betterment of service to the public the time and thought of utility managers, which under the old condition were necessarily consumed in avoiding agitation at franchise renewal time, sometimes by persons with selfish, political or mercenary motives. The Oklahoma revocable permit law will, if preserved and protected by succeeding legislaturs, remove for all time one of the most frequent causes of public unrest, and thus contribute to improving relations between the utility companies, the municipalities in which they operate, and the citizens whom they serve.

In this day of fast action in every field, states, as well as individuals, must take advantage of every circumstance if they would secure and hold the lead. Oklahoma, though young, is fast acquiring her rightful place of high rank among the states. Her progress is more rapid today than ever before. The state, itself, has contributed nothing so important toward continuing and speeding up this progress as in leaving the revocable permit measure, adoptd in 1925, in full force and effect.

SINCLAIR ADDING ANOTHER SEMINOLE PLANT

The Sinclair Oil & Gas Company has started construction work on another natural gasoline plant of the oil absorption type in the Seminole field, Oklahoma. The plant is located in Section 10-8-6, about two miles south of another large Sinclair plant which has been in operation for several weeks. When complete the new plant will have 14 units with an estimated capacity of 18.000,-000 cubic feet of gas daily. The first units are to be in operation by July 1st and the entire plant will be working by Sept. 1st. The natural gasoline department of the Sinclair Company expects to have a total output of 200,000 gallons daily in the Seminole area by the end of the year.

RICHFIELD COMPRESSION PLANT

A compressor plant consisting of three compressors direct driven by 180-h. p. engines has been completed by the gas division of the Richfield Oil Company at Seal Beach, Calif.

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The Gas Company *and the* Dealer

(Continued from Page 31)

service and not a commodity. The satisfaction rendered by this service depends in part upon the appliance and the way it is installed, and it is suicidal to let this important element of its service be controlled by unsympathetic hands. The business of the company cannot develop and increase except as appliances are sold and the entire history of attempts at dealer cooperation show that the merchant will not push gas appliances as intensively as will the gas company. The merchant will sell what the customer wants or what it is easiest to sell him, while a gas company will sell him a gas appliance if it is at all possible. A gas appliance display in its business office is a company's best advertisement. It increases the use of gas, promotes goodwill, draws customers, and educates the public visually to what gas fuel can do and to the various services the company stands ready to render. Notwithstanding the general belief that a gas company is a monopoly protected by the public, the truth is that gas is in active competition with coal, oil, wood, and electricity, and a company must at all times maintain a sales organization or it will lose out in this competition. It must sell industrial appliances because the dealer will not. The financing of this sales organization is an undue burden on a company if it does not have an appliance profit to help out. Furthermore its salesmen, demonstrators, and home service women work under a distinct handicap in not having a definite appliance to talk about and this has been found extremely harmful to their morale.

Customers always have held and always will hold the company responsible for gas service and for advice on utilization, and unless it sells appliances it is not entirely in control of the service and cannot afford to develop an organization capable of giving advice. The rules imposed upon the gas company require it to render as much gratuitous service as it would if it had an appliance department. Furthermore this service is advisable from a public relations viewpoint. The customer should be able to contract for gas service and to purchase an appliance in one place. Except in small communities the gas company cannot entirely control the appliance situation, but it can by active merchandising exert a considerable influence because people usually shop around and make comparisons. It also can do much toward eliminating the price cutting of dealers which has made the appliance business unprofitable even in many communities where the gas company is inactive. There are many instances on record in which the active selling methods of a gas company have so stimulated the demand that the dealers have profited to an unusual degree.

IS HARMONY POSSIBLE?

It can readily be seen that somewhere, sometime, or in some place, every argument presented by both dealer and gas company has been right. In other words there is probably no specific formula which can be applied to fit every situation. Pages have been used up in books of Association Proceedings extolling some satisfactory solution, but a few years later the system has crumbled. The man who was responsible for the happy condition has left the company or a plumbers' union has been formed or the officers of the hardware association have changed. It requires leadership to create harmony between so many diverse interests and gas companies can hardly be blamed if they cannot always supply this leadership.

It would be strange however if after so much discussion and so much experience there could not be some general limits drawn —a limit of activity beyond which the gas company cannot go without creating cause for a just complaint on the part of retail merchants and a limit to cooperation beyond which the gas company becomes the plaything of various and sundry dealer organizations to the serious detriment of its business.

The future of the gas industry depends upon its securing new markets. We want to make gas the universal fuel in the home and in industry and we are justified in this aim by every economic and practical consideration. Its fulfillment is entirely feasible and it can be accomplished in some indefinite period of time whose duration depends upon the solution of numerous problems of utilization. Gas companies must pioneer all new uses for gas and sell the appliances involved in this use. To solve these problems and do this pioneer selling we must have men who can give authoritative advice to prospective customers, who can conduct research and who can sell gas. The training of these men positively requires that a gas company be active in the appliance situation and preferably by selling, for in no way can a man be better trained than by actual practical experience. Men cannot be jumped into solving complicated industrial utilization jobs without mastering the simpler problems, so they should be started at the beginning with domestic appliances. There is the lower limit. No gas company should permit itself to be forced by dealer pressure into a position where it cannot afford to train and maintain an experienced utilization personnel.

The healthy growth of a business requires that a profit be made. The gas company will be compelled to make a profit on whatever appliance sales it makes if it is to be able to support an efficient sales and utilization organization, and the dealer is entitled to a profit for the service he renders to the community and the company. The dealers can be worth a great deal to the gas company if the gas company will build up a demand which makes the appliance business worth while to the dealer. Retail dealers never have done and never will do anything important toward creating a demand; their profits do not permit it; but they can and do stimulate, direct and supply a demand already aroused. The ineffectiveness of most dealer cooperation schemes lies in the failure of the gas company to realize that it must supply ninety-nine per cent of the cooperation, or if it does come to this realization it finds it too expensive. Just as a democratic government is more costly to maintain than an autocracy, so are many cooperative selling plans more costly than one which can be closely supervised.

This then is the upper limit. The gas company sales plan should recognize the dealer and make it profitable for him to engage in the gas appliance business, and engage in it in a way satisfactory to the interests of the gas company.

There is a tremendous leeway between upper and lower limits so defined—leeway sufficient to allow for every reasonable difference there might be between local situations such as the character of the dealers,

the personality of the gas company management, the general state of the business, the seriousness of competition and the historical background. Somewhere between these limits it is possible for every gas company to define a consistent and satisfactory sales policy which will fulfill the requirements laid down by Mr. Kuster as quoted earlier in this article, provided—and this is important—we remember the real answer has already been given by E. H. Nettleton when he said, "A reasonable amount of ability and an immense amount of hard work will bring success with almost any plan."

Canning Fish *by* Gas

(Continued from Page 33)

these burners free of charge.

Our installations in all the canneries have been made in competitive tests against fuel oil.

We do not guarantee service to the consumer, as the gas sold to them is surplus gas. Their oil installation has to be in readiness for use at all times, with a sufficient supply of oil on hand to run them through any threatened shortage.

Naturally when a prospective consumer is approached with a proposition of this kind his first thought is the investment involved, with no surety of service. Accordingly the gas company runs the service, sets the meters, installs the houselines, the necessary regulators and the Bunsen burners, taking the whole into capital. In some cases the consumer, desiring greater efficiency, buys some type of patented burner which the company is glad to install. Even with no guarantee of service, with several curtailments each winter, it has been found that once the plant has become a gas consumer, the engineer, the management and the owners are absolutely sold on gas. In fact, with oil on hand and a change being a matter of only a few minutes, when a curtailment comes it is necessary to personally check each plant to see that it does not continue to use gas. The engineers point with pride to their clean boiler tubes, the comparatively cool brick on the outside of the fire box and the clean boiler room. We are satisfied that we can hold this load, even against a substantial drop in oil prices.

40,000 GAL. CAPACITY FOR NEW EMPIRE PLANT AT SEMINOLE

The Lacey Gasoline plant in Section 14-8-6 of the Seminole area, Oklahoma, recently installed by the Empire Gasoline Company, was placed in operation during the latter part of June. This is the main absorption gasoline plant in the Bowlegs section and has a capacity of 40,000 gallons per day. The Empire Gasoline Company now has five completed and operating gasoline plants in the Greater Seminole producing territory, three of which are installed in the Bowlegs section. The production of gasoline from the Livingston and Davis plants, in the 8-6 district is shipped by pipe line to the Lacey plant, on the railroad, and gasoline derived from all three plants is loaded into tank cars at this latter point. The Empire Gasoline Company installed the first gasoline plant to operate in the Seminole district, which plant started operation in June of 1926.

NEW BUSINESS MEN MEET

New business managers in the Joplin, Mo., district of the Gas Service Company met at Joplin on June 19 to discuss sales policies for the rest of the year. House heating also came in for special discussion.

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Large sections of pipe lines of various companies are protected with "McEVERLAST".

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MONTAGUE PIPE & STEEL CO

San Francisco California

NATURAL GAS GASOLINE OPERATIONS

Compiled by E. T. Knudsen

Department of Commerce, Bureau of Mines, Division of Mineral Resources and Statistics

ONE hundred and forty-seven natural gas gasoline plants with a daily indicated capacity of 1,421,600 Thousand Cubic Feet, report a recovery of 40,969,464 gallons of natural gas gasoline from 28,838,564 thousand cubic feet of gas treated in May. This is a decrease of 912 barrels in Daily Average Production.

Utilization of natural-gas gasoline amounted to 973,336 barrels, an increase over April of 43,724 barrels. Daily average utilization of 31,398 barrels was 69 barrels less than Daily Average Production of 31,467 barrels.

Stocks of natural-gas gasoline at the end of May amounted to 611,549 barrels of which 33,556 barrels were reported by natural-gas gasoline plant operators and 577,993 barrels by refinery operators. This is an increase of 2,127 barrels over April stocks. This stock figure of 611,549 barrels is approximately nineteen and one half days supply at the current rate of consumption.

Production of gasoline during the month of May amounted to 4,864,233 barrels, a daily average of 156,911 barrels. This is a decrease of 69,969 barrels or 1.42 per cent under April output and an increase of 605,799 barrels or 14.23 per cent over the output of May 1926.

Of the total gasoline produced 18,978 barrels were reported as finished gasoline produced by natural-gas gasoline plant operators. Production of gasoline from Cracking Processes decreased in May to 237,201 barrels.

Stocks of gasoline show a decrease of 923,054 barrels during May and at the end of the month amounted to 12,321,769 barrels. This stock figure includes 18 barrels of finished gasoline reported by natural-gas gasoline plant operators.

CALIFORNIA NATURAL GAS GASOLINE PRODUCTION
DISTRIBUTION AND STOCKS
May, 1927

PRODUCTION *Type of Plant*	*Gas Treated M. C.F.*	*Natural-Gas Gasoline Produced Gallons*	*Gasoline Recovery Per MCF Gas Treated*	
Oil Absorption	12,386,723	19,143,729	1.546	Gal.
Compressor	254,556	392,209	1.541	"
Combination Comp. and Oil Absorption	9,869,917	16,449,518	1.667	"
Combination Oil and Charcoal Absorption	5,163,678	4,896,476	.948	"
Charcoal Absorption	1,163,690	73,722	.063	"
Drip	.....	13,810	.....	"
TOTALS	28,838,564	40,969,464	1.421	"
Finished Gasoline produced at plant				18,978 Bbls.
DISTRIBUTION				
Stocks First of Month	.....	..... Bbls.	609,422	Bbls.
Production during Month	.....	..... "	975,463	"
Quantity Mixed with crude or Unfinished Oils		389,449 "		
Used in Blending at Refineries		498,863 "		
Stocks end of Month		611,549 "		
Used at Plants, Shortage and Evaporation losses		16,201 "		
Balance		68,823 "		
TOTALS		1,584,885 Bbls.	1,584,885	Bbls.
STOCKS				
Natural-gas Gasoline held by Natural-gas Gasoline Plant Operators		1,409,354 Gal. or	33,556	Bbls.
Natural-gas Gasoline held by Refiners		24,275,706 " "	577,993	"
TOTALS		25,685,060 " "	611,549	"
Finished Gasoline (Motor Fuel) held by Natural-Gas Gasoline Plant Operators				18 Barrels

MAGNOLIA ADDS TWO UNITS AT SEMINOLE PLANT

The Magnolia Petroleum Company recently completed the installation of two additional units of Southwestern type to their absorption gasoline plant at Seminole, Okla. The plant now consists of four Southwestern units, and with the recent addition is capable of producing around 8,000 gallons of gasoline daily. This company recently completed the installation of a stabilizer at the Seminole plant and it is now preparing naphtha blended gasoline through this equipment, instead of in the stock tanks. Gas treated is taken from the company's wells in the Earlsboro pool.

TO SERVE TEHACHAPI

Midway Gas Company has been authorized by the Railroad Commission of California to exercise franchise rights to serve the town of Tehachapi from its Monolith gas line.

HEMET-SAN JACINTO VALLEY GETTING NATURAL GAS

Southern California Gas Company has begun construction of a 17-mile high-pressure transmission line to carry natural gas into the Hemet-San Jacinto Valley. The company will extend a pipe line from Redlands to Beaumont, where deliveries will be made to Twin Cities Gas Company, which serves the communities of Hemet, San Jacinto, Banning and Beaumont.

Approximately 70 per cent of the cost of this transmission line is being borne by the Southern California Gas Company, and the remainder by the Twin Cities Company. Manufactured gas is now being served in these communities, and the substitution will result in the supplying of gas of considerably greater heat and fuel content.

The Southern California Gas Company is also building supplementary transmission lines from its plant in Colton to Loma Linda and to San Bernardino.

Temperature Fluctuations

(Continued from Page 39)

Records were obtained, for a period of one year, of the temperature of the gas flowing in a 3-inch pipe line lying on top of the ground, and of the gas flowing in a near-by 6-inch line that was buried to a depth of 18 inches. Recording thermometers, of the external bulb type, which had been calibrated against standardized mercurial thermometers, were used for the temperature measurements. The bulbs of the thermometers were inserted through special stuffing boxes so that they were in direct contact with the gas flowing in the pipe lines.

RESULTS OF THE TESTS

The results of the tests are shown in Figure 1. Curves 1 and 2 show respectively the maximum and minimum daily temperatures of the gas flowing in the 3-inch uncovered line; and curves 3 and 4, the maximum and minimum daily temperatures of the gas flowing in the 6-inch covered line.

As shown on the chart (Curve 1) the temperature of the gas flowing in the 3-inch uncovered line reached a maximum on August 8, 1924 of 139°F. On the same date the minimum temperature was 65°F. (Curve 2). The temperature of the gas thus fluctuated during this day through a range of 74 degrees. On December 31, 1924, a maximum daily temperature of 26°F. (Curve 1) and a minimum temperature of 25°F. (Curve 2) were recorded; thus the fluctuation during the day was only 1 degree. However, the average daily fluctuation for the entire test of gas flowing in the 3-inch uncovered line was about 65 degrees Fahrenheit.

On August 8, 1924 a maximum temperature in the uncovered line of 139°F. was recorded. The minimum temperature of 1 degree below zero was recorded December 27, 1924. The maximum annual fluctuation, therefore, for the gas flowing in the 3-inch uncovered line was 140 degrees Fahrenheit.

In comparison, as indicated by curves 3 and 4, the average daily temperature fluctuation of the gas flowing in the 6-inch buried line was only about 2 degrees Fahrenheit while the annual fluctuation was only 45 degrees.

IT PAYS TO BURY LINES

These results explain the high rates of leakage that often occur from field lines and other lines that are not covered with earth; and show the importance of ditching and burying pipe lines. A striking example of this was found in a leakage survey recently completed. A transmission system in a hilly district was tested for leakage. In the roughest part of the district where the lines were uncovered on account of the high initial cost of ditching, the annual leakage averaged about 2,000,000 cubic feet per mile of 3-inch line at 100 pounds per square inch gage pressure. On the same transmission system, where the topography was more favorable for ditching, and the lines were buried, the annual leakage varied from only 100,000 to 200,000 cubic feet.

The results also explain the difficulty of obtaining correct volumetric measurements with orifice meters under conditions of widely fluctuating temperature, as in uncovered pipe lines. In practice, the only data recorded generally for volumetric measurement with orifice meters are the differential and static pressures.

A coefficient, which is based upon a temperature of 60°F., is used for computations.

An appreciable error is introduced in the volumetric measurement, due to the temperature differences. Even if corrections were attempted for the temperature changes, it would not be possible to correct the volumes when the temperature fluctuated rapidly.

In applying a correction factor that would correct the volume to a base temperature of 60 degrees, there is more or less error introduced even if the fluctuation is not great. The curves on the chart in Figure 1 show that the temperature in the buried line varied less from the standard base of 60 degrees Fahrenheit than did the temperature in the uncovered line, and, as a result, more accurate measurements of volumes could be obtained in the buried line.

The results shown on the chart also are applicable in the construction of gasoline pipe lines, and show the importance of burying lines to eliminate undesirable "breathing losses."

These temperature tests were conducted in only one locality, and the actual data therefore are strictly applicable only to the one set of conditions. However, the general effects of temperature variations are the same in any part of the country, and the results in this particular case indicate what to expect under other conditions. Further study is needed to determine the exact economical depths of cover required to offset undesirable temperature fluctuations under various operating conditions, and the Bureau hopes to continue the study during the next year.

ACKNOWLEDGEMENTS

This investigation was conducted under the direction of the Bureau of Mines with the cooperation of the State of Oklahoma.

The writer is indebted to E. O. Bennett, formerly natural gas engineer, I. B. Williams, formerly associate natural gas engineer, of the Bureau of Mines, and E. N. Armstrong, engineer, Indian Territory Illuminating Oil Co., for valuable assistance in conducting the field tests.—Reports of Investigations, Bureau of Mines, Department of Commerce.

SKELLY ABSORPTION PLANT WORKING IN PANHANDLE

Skelly Oil Company's new absorption natural gasoline plant in the Panhandle area of Texas, was recently completed and placed in operation. The plant is located in Carson County, on Skelly's 12,500 acre Schafer lease in block 88. As an insurance to a long operating life for this plant it is planned that it shall serve a total potential producing area of some 18,000 acres. The present capacity of the installation is 20,000 gallons daily, but work has already commenced which will result in doubling its capacity. The company has its treating plant installed, to sweeten the gasoline production, employing the sodium hypochlorite pocess of treating. Electricity for lighting purposes and for power to drive the auxiliary units is generated by an electric plant on the same site.

REBUILD ABSORPTION PLANT DESTROYED BY FIRE

The absorption natural gasoline plant of the Lone Star Gasoline Company, near Gordon, Texas, destroyed by fire about the middle of June, is now being rebuilt. The plant is one of the major plants of the Lone Star Gas Company, having a rated capacity of 15,000 gallons of gasoline daily. The company expects to have the new plant built on the old site and in operation within a period of three months.

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Measurement Practice *is* Improving

(Continued from Page 37)

the valves. Regulators took from five to thirty pounds difference in pressure to raise and lower the valve stem. The area between these curves gives a measure of the friction in the regulator. Some regulators showed as much as six pounds variation caused by friction. It was also discovered that there was considerable change in the effective area of the diaphragm from the closed to open position of the valves. Considerable doubt has been expressed by many engineers as to the extent of this change in effective area. The effective area changed in one regulator, with a seven-inch head, from 14 square inches to 22 square inches. This change in effective area, means, to open the regulator gradually, requires the addition of weights, as the amount of gas passing the valves increases. Of course, the weights must be removed as soon as the load is reduced or the pressure will materially increase on the outlet side before the regulator will close.

This change in effective area was entirely overcome on one type of regulator by using an auxiliary regulator, commonly used on oxygen tanks. The weights and levers were removed, and the inlet of the oxygen regulator connected to the line on the high pressure side. The outlet was connected to the diaphragm case and this pressure from the oxygen regulator took the place of the lever and weights. With this auxiliary control one-fourth of a pound pressure would open and close the valves when no gas was passing. This, I believe, conclusively shows that this variation in pressure, shown on the curves, was due to a change in the effective area of the diaphragm.

BEST RESULTS FROM HUBLESS VALVES

Various types of hubs were tried on the valves. What I have called a hub is the extension placed upon the upper valve by the manufacturers and was intended to keep the valves from chattering and the regulator from vibrating. It was found that the hub on both the upper and lower valves made the regulator very noisy and unsteady. The hub on the upper valve alone caused the regulator, at certain flows, to lose its equilibrium and it would take from five to fifteen pounds to bring it back to its original position. Our final conclusion was that valves without any hubs gave by far the best results. The result of the whole investigation, we hope, will be an improvement in the regulators by the manufacturers which, as said before, will truly benefit the measurement of the gas.

One other change, which seems to be a step forward, is the tendency toward the use of smaller ratios of the diameter of the orifice to the diameter of the pipe, or the ratio of $\frac{d}{D}$. On city gate measurement this of course means more tubes, but it has the advantage of making the station more flexible during changes in load. Differential valves can be used very effectively with the increase in the number of tubes if so desired.

Considerable improvement has also been made toward the elimination of pulsation from compressor stations.

Several years ago it was found that at certain times, in one of the Oklahoma Natural Gas Corporation's stations, the inlet meters showed less than the check meters on the opposite side of the street. After considerable investigation it was decided that this variation and fluctuation in the differential was due to the fact that the gas was passing from the regulator to the flange in a spiral motion.

STRAIGHTENING VANES USED

Knowing the Government found it necessary to use straightening vanes in the aeroplane wind tunnels at McCook Field, Dayton, Ohio, we decided to make a similar installation here. The result was a decrease in the variation between the inlet and outlet meters, the differential steadied down and we were surprised to find the vanes decreased the noise from the station about one-half.

The Technical Research Committee of the Natural Gas Association used the straightening vanes in determining coefficients for their parent orifices at Cleveland. They spent the greater part of last summer at Buffalo testing the effect of straightening vanes on orifice meters. The results of this work are looked forward to with a great deal of interest and no doubt will give us new requirements for setting up a standard orifice meter run.

From a very humble beginning gas measurement has in a few years developed into an important place in the gas industry and our measuring equipment and methods of operation are rapidly improving. Association, companies and manufacturers are cooperating in establishing better standards. Uniform flow and better regulation are recognized as essential to satisfactory results. Each year brings forth substantial developments in our efforts to get better and more consistent measurement.

ROPER TAKES ON KENNEDY SHEET FLAME HEATER

The Geo. D. Roper Corporation of Rockford, Ill., which recently took over the Kennedy Sheet Flame Radiant Heater from the Radiant Heat Corporation of America, has moved the manufacturing equipment for the purchased line from New York City to Rockford, and production of the heater is rapidly getting under way. It will henceforth be known as the Roper Sheet Flame Radiant Heater, and its distribution will follow the same policies as other Roper lines. The Kennedy Heater is well known, and has been approved by the American Gas Association Laboratory.

GASOLINE FOREMEN HEAR MAGNETO TALK

On May 28 foremen of the Standard Gasoline Company listened to a talk on compressor engine magnetos, given at Ventura by Dell Taylor of the Pacific Automotive Service Company, Los Angeles.

INCREASE OUTPUT OF HEALDTON PLANT TO 10,000 GALLONS

The Magnolia Petroleum Company has a large force of men at work at its absorption natural gasoline plant 20 miles north of Healdton, where the plant is being enlarged in capacity through the addition of two Southwestern type units, giving a total of six Southwestern units, and increasing the plant production of gasoline to about 10,000 gallons daily. Gas for this plant is derived from the County Line and Fox producing districts, where wells are heavy gas producers from a depth of about 3300 feet, some of them being the largest producers of gas in Oklahoma.

Testing Soil

(Continued from Page 34)

cu. ft. of gas per day from Ventura to Los Angeles. As this line is to be in constant service and will be used for a long period of time, great care was taken to prevent soil corrosion.

In order to determine the effect that the soil might have on it, samples were taken from several locations along the line. These were not taken at regular intervals, but were selected at points where there seemed to be a change in the soil conditions. Care was taken to get the sample of soil from the depth at which the pipe was to be laid.

The samples of soil were placed in the containers of the test set and a test of the soil along the entire line was made at one time. The result is given in table No. 1.

In order to get a comparison of the corrosiveness of the soils encountered along the line as compared to other known soils, we adopted the methods shown in figure No. 2. In this the number of grams of metal lost from the sample during a twelve-hour test period was used as the abscissa and the locations along the line were used as the ordinate.

Sample No. 1 is shown to have lost 0.77 grams and sample No. 2 to have lost about 0.20 grams, etc., as shown.

Along with this the comparative soils are plotted as "Very good soil," "Eight year soil" and "Two year soil." It will be noted that the general average of the soil along this line would fall near the "Eight year soil" line. Samples 1 and 3 show a very bad soil condition.

This gave us a basis upon which to determine the kind of protection best suited for a pipe line laid in this location.

There is still room for a great deal of experimental work which will be necessary in order to perfect this method. But with our present knowledge we feel that we have been more than repaid for all of our efforts and also that our new line is safe from corrosive elements for a long period of time.

UPHAM GAS CO. CONTRACTS TO SERVE OLNEY, TEXAS

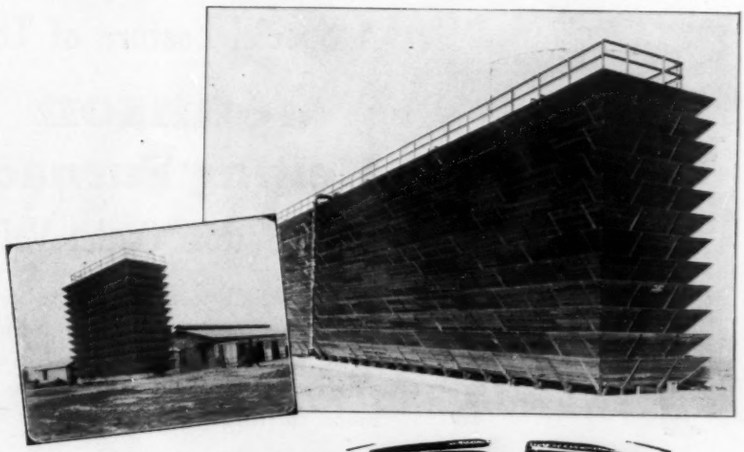
The Olney, Texas, city council recently ganted a franchise to the Upham Gas Company permitting distribution of natural gas in that city. The contract povides that Olney service shall begin by October 1, 1927. A maximum rate of 75 cents per thousand feet for the first 25,000 feet will be charged, with a graduating scale down to 20 cents per 1000 cubic feet for consumption over one million feet. Commercial rates specify 50 cents per thousand for the first 100,000, graduating to 22 cents. Industrial gas will be furnished at 17 to 11 cents, the same rate as that at Wichita Falls, Tex. This gas is drawn from the Panhandle fields of west Texas and transported by the recently completed Upham pipe line.

OPEN MARION OFFICE

On June 4 the Marion Gas & Service Company of Marion, Kansas, held its official opening in that community, the display room being fitted with many gas appliances, and a cooking demonstration being held to acquaint housewives with proper methods of using gas.

WEST TEXAS CHAMBER HAS OIL AND GAS DIVISION

An oil and gas division of the West Texas Chamber of Commerce was formed recently.



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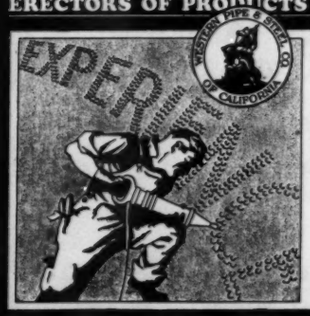

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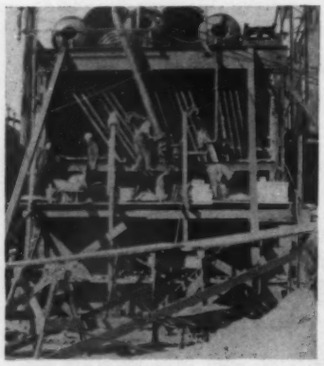

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Complete Gas Service

(Continued from Page 35)

Contents of the Booklet include suggested piping specifications to be written into the plumbing order, a page for exterior piping, and another for interior. This last contains such items as: Piping from meter to kitchen for gas range, piping to location of hot water heater, gas house heater, incinerator, refrigerator, fireplaces; piping to laundry for clothes dryer, ironer, washer; piping to location of gas garage heater, and to location of emergency lights.. Attention of the prospect is called to the importance of considering these items while the home is under construction, so that the best gas service may be had at a minimum cost.

On succeeding pages are found specifications for the various gas appliances, the specifications appearing at the bottom of the page and a booklet prepared by the manufacturer being attached at the top of the page. Prices are quoted installed, and both term and cash prices are given. There are separate pages for the range, the refrigerator. the laundry stove, ironer, etc.; and there is a special "House Heating Estimate Sheet" giving detailed information on the heating requirements, proposed equipment, and estimated cost of heating service. Space for entering data on present equipment is also provided, to allow for filling in information needed in selling buildings already erected. For a number of appliances the company recommends definite sizes and designs of the line handled, bearing in mind of course, the requirements for good service, as well as the known preferences of the prospect in such matters as style and appearance of appliances.

It is left to the local salesmen to distribute the booklets to best advantage, the aim being to get them into the hands of those most directly interested in purchase of appliances and specification of piping. The salesman is best qualified to secure this result.

WHAT THE SALES RECORD SHOWS

In 1924, prior to the adoption of our Gas Specification Booklet Plan, our merchandise and piping sales fell off by 6.5 per cent from those of 1923, although our meters increased from 15,536 to 16,720. During 1925 we developed the plan just described, and our merchandise sales rose from $165,997.24, the 1924 figure, to $188,663.46, which was considerably over the 1923 total of $173,335.91. Piping sales saw a similar result: $63,647.10 for 1925 as compared to $40,761.20 for 1924 and $48,118.30 for 1923. Meters increased to 18,318 in 1925. Figures for 1926 tell the same story even more decisively, merchandise sales for the first seven months exceeding those of 1925 for the same period by $24,100.98.

Our gain in sales we credit in great part to the booklet idea, and can strongly recommend it to the consideration of gas utilities everywhere who are faced with similar problems. There is a definite advantage in assembling complete gas service information, individualized to a single prospect's needs, in usable form. We have found that it enables us to sell a more complete gas service, more satisfactory from our viewpoint and from that of the future consumer, than would otherwise be possible.

RANGE MANUFACTURERS MOVE TO NEW L. A. ADDRESS

Holbrook, Merrill and Stetson, manufacturers of the Holbrook line of gas ranges, have moved their offices from 750 North Spring St., Los Angeles, to 903 North Main Street.

Transmission Activities

(Continued from Page 30)

Texas the largest of which is Brownsville, is laying a 140-mile main from gas fields near Hebbronville to the several towns. Twelve inch pipe will be used for 120 miles of the line, and 8-inch for the remainder. The company sold a $3,500,000 issue of first mortgage bonds some time ago in the interests of financing the above project.

Southern Natural Gas Company of San Antonio, Texas, has since the first of the year completed several extensions, and begun others. A 20-mile extension of 8-inch Dresser coupled line was finished in January from the company's 12-inch main line in the Cole field, Duval County, to the Henne, Winch, and Farris field in Jim Hogg County, greatly increasing the Southern's gas reserves. A subsidiary company, the Western Gas & Fuel Company, completed 35 miles of 8-inch line from the new Medina County field to San Antonio, and a 4-inch line was also laid from the same field to the towns of Hondo, D'Hanis, and LaCoste, where gas is now being distributed. An extension is now being made north from San Antonio to the communities of New Braunfels and Seguin, which, together with the piping of the towns, will be complete before winter.

Late in June the 185-mile 18-inch Lone Star Gas Company's line running from the Shamrock field in the Panhandle gas area to Petrolia Junction was expected to be complete.

The Lone Star system will soon be extended to San Angelo, from Abilene, serving towns en route. About 80 miles of main will be laid for this project. Anther 24 miles will go to the extension from Waco to Marlin; 41 miles of new 16-inch line will connect Waco to Temple, and some 65 miles of 14-inch main will carry on to Austin from Temple.

Since January 1, 1926, the Lone Star has connected 54 communities to its system, laying a total of 554.7 miles of main. Of this, 181.5 was 18-inch line. Lone Star's system is the largest in north Texas, and is made up of some 1810 miles of main.

Houston Pipe Line Company's chief transmission accomplishment has been completing the extension to Galveston, bringing gas to in the past year. Since January 1, 1926 the that city in time for fall use, and supplying refineries and other industrial plants along the Houston ship canal. This organization is estimated to distribute some 80,000,000 cubic feet of gas daily in and around Houston, being the largest pipe line company in the Texas Coastal country.

Upham Gas Company has lately completed a line to Wichita Falls, Texas, from the gas fields at Shamrock, Texas.

WYOMING LINE LAID

A 74-mile line from the Little Buffalo Basin field of Wyoming to bring gas for industrial and domestic use to Worland and Greybull is being laid at an estimated cost of $1,600,000, by the Midwest Refining Company, the line to be operated by the Midwest-Wyoming Gas Company, a subsidiary. The greater part of the line is of 12-inch and 14-inch pipe, with 8-inch laterals into the communities to be served. The refinery of the Standard Oil Company (Indiana) at Greybull is a large user of gas from the Midwest-Wyoming Gas Company. The Wyoming State Industrial School at Coulter will also get gas by an extension from the new line, from Worland.

In California the latest large transmission enterprise is that of the Ventura Fuel Company, bringing gas from the Ventura fields

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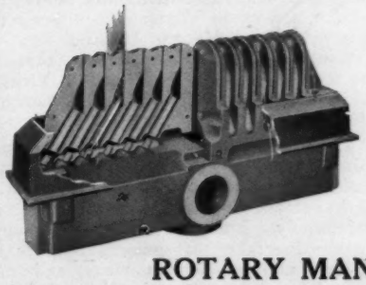


Our patrons regard the installation of these gas burners in their apartment houses, hotels, and office buildings as an investment.

AN INVESTMENT OF MERIT

ROTARY MANUFACTURING CO.
5720 Long Beach Avenue **Los Angeles, California**

to a point at Calabasas, 42½ miles from Ventura, where lines of Los Angeles companies carry it into the city for distribution. Fifteen-inch O. D. pipe was used in this carrier, which delivers about 50,000,000 cubic feet of gas daily, and is the largest transmission line on the Coast. Part of the gas goes to the city of Long Beach, adding a greatly needed reserve to the municipal gas department's supply. Cost of the Ventura Fuel project is estimated at from $2,000,000 to $2,500,000.

Midway Gas Company completed its new 16-inch high pressure line from Castaic Junction to the company's terminal station at Glendale, at the first of the year. The line is a continuous welded system, laid at a cost of $600,000, and supplements two 12-inch mains from the same point, increasing capacity from 44,000,000 to 65,000,000 cubic feet a day. Midway also completed its 2800 horsepower compressor station in the Ventura field about the same time the Castaic line was put into service.

Projects mentioned above have all been either completed within recent months, or are about to be complete. There are a number of other lines also building or complete, which have not been treated of for lack of details, but those discussed in themselves represent many millions of dollars in their lump cost, and indicate that the sum total of industries and consumers sharing the benefits of gas service has been tremendously increased.

MORE DEVELOPMENTS DUE

It seems assured that the next year's developments will be scarcely less impressive than those of the last, in point of the importance of gas transmission undertakings. In connection with the purchase of the Oklahoma Natural Gas Corporation by the Phillips Petroleum Company, which was effective in May, there was announced a project for laying a 200-mile, 22-inch transmission system to connect the Oklahoma Natural Gas Corporation's lines with Texas Panhandle gas. It is understood that the line will probably extend from Borger, Texas, to El Reno, Okla. This enterprise when complete will enhance the gas supply of about 50 of the principal communities of central and southern sections of Oklahoma, making possible a large expansion program for gas service in those cities.

Dixie Pipe Line Company, newly organized, has completed its plans for the laying of a 240-mile pipe line from northern Texas and western Louisiana to Port Arthur and Houston, Texas. The line will be a combination of 22-inch and 18-inch pipe and will have a capacity of around 100,000,000 cubic feet daily. Its cost is estimated at $10,000,000. Prior to the announcement of the new line O. R. Seagraves, president of the Houston Gulf Gas Company, and also president of the Dixie Pipe Line Company, announced purchase of 1,500 acres of gas lands by the company, in and around Waskom fields, located on the Louisiana-Texas border line. In addition to these properties the company has taken over The Texas Company's gas properties in Louisiana and acquired several smaller gas producing companies in the western Louisiana territory. From the Waskom field to Livingston, Texas will be laid a 22-inch main, approximately 140 miles, dividing into two 18-inch lines, one extending into Houston and the other into Port Arthur.

Another line of tremendous importance, if circumstances permit its construction, is that contemplated from the Amarillo fields of Texas to Denver, Colorado. This project has been in the spotlight ever since the Public Service Company of Colorado in connection with its renewal of franchise early this year promised to make an effort to bring natural gas to Denver. Recent announcement has been made of the organization of the Colorado Interstate Gas Company, representing Standard Oil Company of New Jersey, and Prairie Oil & Gas Company interests, with which the Public Service Company has tentatively contracted for the holding of large gas acreage in the Amarillo field, and the laying of a 350-mile line to Denver. Construction of the line to Denver depends upon the action of that city in granting the company rates making the line possible. A proposed franchise was submitted to the city council for preliminary consideration about the middle of June, and it is understood that the company will offer an initiated ordinance, after council consideration has been given it.

The Denver line would be one of the largest of gas transmission efforts, to cost some $22,700,000 in its accomplishment, with another estimated $2,000,000 of work in putting the Denver distribution system in readiness for natural gas. By far the largest consumer would be the Colorado Fuel & Iron Works, at Pueblo, which would contract for the base load of the large carrier. In fact, company officials are quoted as saying that there is some liklihood that the line may be built to Pueblo even if the city of Denver rejects the franchise proposals.

For the past three or four years the matter of bringing natural gas to Salt Lake City has come up for consideration, and present gas conditions, at least, indicate that it has greater feasibility than ever before. The supply originally contemplated covered only the Baxter Basin field south of Rock Springs, Wyoming. In the past year, however, there have come to light new reserves in the Hiawatha field on the Colorado-Wyoming line, about 18 miles east of the corner of Utah, a new field, the Clay Basin, in the northeast corner of Utah, and other accessible fields which give the desired permanency to the total available supply. Companies holding large gas acreage in this section are interested in the Utah pipe line enterprise, among them the Midwest Refining Company, Standard Oil Company of Ohio, Salt Creek Producers, and the Prairie Oil & Gas Company. One recent report on the line contemplated is to the effect that it would be of 18-inch pipe, 200 miles in length, to deliver 25,000,000 cubic feet of gas daily to Salt Lake and Ogden industries and domestic consumers. The line would have capacity to carry additional gas as industrial demand developed in the Salt Lake Basin.

Permits have been taken out in Arkansas for two sizable gas lines, one a 75-mile 10-inch line from the new gas field near Clarksville, Johnston County, Arkansas, to Conway. Work on this line was under way in may. A 150-mile 12-inch main from the Monroe fields to La Pile, El Dorado, Camden, Bearden, Thornton and Pine Bluff, with a branch to Warren, is a project announced by the Morgan Utilities, Inc.

Another contemplated line is that from the Monroe fields of Louisiana to Vicksburg and Jackson, for which J. H. Thatcher of Houma, La. holds franchises.

There are of course numerous other transmission developments in the offing, some of them being of a nature so nebulous that they perhaps will remain in the "project" state indefinitely. But with natural gas supplies on the increase, transmission activity must follow, and economical ways and means must be sought along the line of development of new markets. This means not only construction activity and addition to plant properties. It means also increased sales effort all along the industrial and domestic utilization front, in advance of these new projects; and, after their consummation, it means sales effort to hold the increased load and make it continue to grow. The construction engineer and the gas company merchandising department find their interests closely linked in the prosecution of these costly gas line developments.

Pressure Regulation

(Continued from Page 45)

regulator was used where approximately 100-pound gas was to be reduced to 40 pounds, very accurately. The weights which ordinarily are placed on top of the diaphragm were discarded as outlined above. It was found that the 12-inch regulator installed in this manner was extremely sensitive and controlled the outlet pressure within one-fourth pound under any variable load condition. This system can be attached to the Emco High Pressure regulator because of its design having the outlet pressure under the diaphragm and having a minimum friction.

We know that high pressures can be controlled very accurately when desirable.

L. P. Supersensitive Regulators: Getting back again to the types of regulators we have one more to consider, namely the L. P. type supersensitive.

We have discussed the change in effective area of a diaphragm as causing the variation in outlet pressures of High Pressure Regulators. To overcome this effect in regulating low pressures, we have made our diaphragms of leather and have formed them in such a way that there is a very minimum change in effective area. By doing this we are able to place a certain weight on top of the diaphragm and have the weight balanced by a certain pressure. This pressure then will balance the weight at practically any point in the diaphragm and valve travel.

Looking into the future, we can see a development in regulators which will make everything automatic. This will be accomplished when a regulator both H. P. and L. P. can be installed which will automatically boost the outlet pressure to the proper point to offset the additional load and then reduce it again when the load decreases. With this arrangement, the pressure on lines and systems could be maintained at an absolute minimum point. The pressure curve would, then, not be a uniform line but would follow directly the gas demand.

It is my hope that the problem of gas regulation will be given the same careful consideration that is given to gas measurement. The two are very closely related and it is good policy to make this relationship very intimate in the organization of the gas company personnel.

SPRINGFIELD MERGER

Announcement has been made of the merger of the Springfield, Mo., Gas and Electric Company and the Springfield Traction Company into one operating organization, the companies having been under the same ownership previously.

HELMRICH LEAVES OKLAHOMA

Professor G. Bernard Helmrich, who has had charge of the Southwestern Gas Meter Short Course at the University of Oklahoma for the past four years, has resigned from the university staff to become designing engineer for the Detroit Edison Company.

'UNACCOUNTED-FOR GAS'

Comments about *Western Gas* from our readers, old and new.

"Your publication bridges a gap long existing in the natural gas industry. *Western Gas* gets preferred attention in this office, although we receive over forty other publications monthly."—*H. Lee Jones,* Director, Information Bureau of Kansas Public Service Companies, Topica, Kan.

"*Western Gas* is good—as far as it goes. I like page 28 of the June number; give us more. Seems to me you should pay much attention to problems of our industry, and their answer."—*W. E. Richmond,* Emp. and 1st aid officer, San Diego Cons. Gas & El. Co., San Diego, Calif.

"Your publication represents to good advantage and most aptly fills the need of 'gas service' in the inter-mountain and coast country."—*LeRoy D. Simmons,* Adv. Mgr., and Dir. Pub. Relations, Utah Gas & Coke Co., Salt Lake City, Utah.

"I thoroughly believe we need such a magazine on the Pacific Coast; I read it very thoroughly and get a great deal out of it."—*L. R. Payne,* Gas Salesman, Pacific Gas & El. Co., also Secy. San Jose Unit Gas Appliance Society, San Jose, Calif.

"Your magazine fills a long-felt want."—*W. A. White,* Supt. Gas Dept., City of Long Beach, Long Beach, Calif.

"Your magazine is a fine feature, and I can hardly wait for the numbers."—*Andrew Anderson,* Trans. Supt., Midway Gas Co., Burbank, Calif.

"You are turning out a very good magazine, and interesting to me because of the Western viewpoint."—*W. S. Dole,* Gas Engr., Federal Light & Traction Co., New York, N. Y.

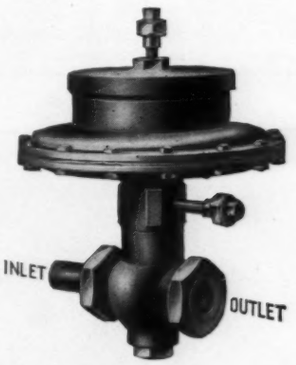
"*Western Gas* has made a big hit with me; it is both interesting and instructive, and gives me Pacific Coast ideas first hand."—*F. J. Gartland,* Production Engineer, Public Service Co. of Colorado, Denver, Colo.

"*Western Gas* O.K. Give us more on pipe protection."—*W. E. Gentner,* district Supt., So. Counties Gas Co., San Pedro, Calif.

"I receive great benefits and much enjoyment from reading what other people are doing, as written in *Western Gas.*"—*C. G. Fiscus,* Com. Dept., Western States Gas & El. Co., Stockton, Calif.

"The few issues we have received thus far have contained much interesting and helpful information."—*O. C. Stokke,* Supt. Gas Dept., N. W. Public Service Co., Huron, S. D.

"After reading four of your *Western Gas* magazines I can say that it broadens my view of the gas industry more than any other magazine or book."—*William Barents,* Gas Serv. Man, L. A. Gas & El. Corp., Los Angeles, Calif.



Fulton Dead Weight Governor

An unusually sensitive, frictionless and long-lasting governor to be used either as a direct governor, or for individual service. Maintains a uniform pressure throughout the entire range of flow.

WRITE for the Chaplin-Fulton 60-page catalog! It's free and contains data on our many time-tested and proven gas regulators that you will find invaluable in your work.

The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the County. Built in all Sizes, From ¼ Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

28-36 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES:

WESTCOTT & GREIS, Inc. Sales and Service Dallas—Los Angeles—Tulsa

JNO. W. CRAWFORD Sales Engineer 1855 Industrial St., Los Angeles

C. B. Babcock Company

"We Serve"

135 Bluxome Street, **San Francisco, California**

WITH THE MANUFACTURERS

New Appliances and Equipment

Radiantfire-Mantel

General Gas Light Company, Kalamazoo, Mich., has recently begun manufacture of a combination Radiantfire heater and mantel, known as the Humphrey Radiantfire-Mantel No. 500. The new number is a complete fireplace, made up of a wood mantel with front panel facing and a Humphrey Radiantfire. The Radiantfire and front panel facing are made of a rustless steel in an armor bright finish, are free from electro-plated finish or lacquer, and therefore, will not scratch, stain or tarnish. The upper panel of Radiantfire front is removable so the flue connection is accessible. The hearth is also removable exposing the burner for connection or cleaning.

The new Humphrey Radiantfire product, says the manufacturer, has been created to reduce fireplace cost to a minimum while securing a highly artistic appearance.

Air-Driven Portable Hand-Saw

Ingersoll-Rand Company, 11 Broadway, New York City, has developed an automatic portable hand saw, operated by compressed air. A shift of blades fits the saw for use in cutting various materials. The saw is made in three sizes, B6, B8 and B12, taking 6-inch, 8-inch and 12-inch blades, respectively. The B8 size weighs only 23 pounds. The design of the saw combines the Ingersoll-Rand 3-cylinder type of air motor, long in use in I-R grinders and light weight drills, with the Crowe safety saw guard. The safety guard is of telescopic nature, opening when saw is applied to material and automatically closing and locking in position when cut is complete. The saw guard has an adjustable stop so that saw can be set for required depth of cut. The 3-cylinder air motor is of the balanced type, all wearing parts being renewable. Manufacturer states that hand-saw methods are cut from 50 to 75 per cent by the new method.

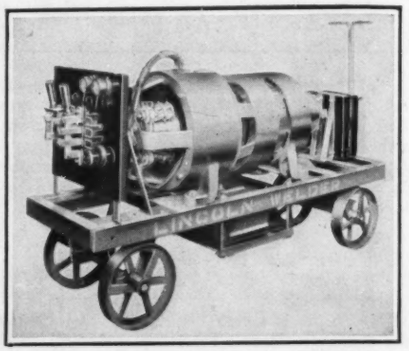
Spray Gun

Alexander Milburn Company, Baltimore, Md., has brought out a 3-in-one paint spray gun for use either as a siphon-feed, pressure-feed or gravity-feed spray, adaptable to use on low air pressure or ordinary garage compressor.

The gun is equipped with adjustable, self-centering fluid pin to control volume of paint; interchangeable nozzles; bayonet-type lock on container cover to take up slack; patented, elevated air vent; trigger control for both air and paint. It is of all metal construction.

Arc Welding Machine

Lincoln Electric Company, Cleveland, Ohio, is substituting welded structural steel in place of gray iron castings in its "Stable-Arc" welder, shown in the illustration. The 1927 model, 300-ampere alternating current power supply outfit pictured contains only two gray iron castings weighing about 15 pounds total. Motor and generator end rings, brackets and connecting ring are all



of structural angles rolled into proper shape and welded together. The feet of the motor generator set are made of drop forgings. Truck wheels are of T-sections rolled on a special machine. Hub of wheel is of steel tube. Control panels, usually made of slate or special non-metallic compounds, is made of sheet steel welded together and welded to the supports.

It is claimed that the steel construction reduces liability of the machine's failure under severe operating conditions, since parts will bend rather than break, and may be straightened without waiting for replacement castings.

Incinerator

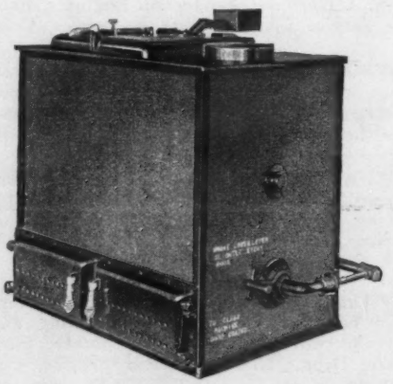
Home Incinerator Company, Milwaukee, Wis., has introduced its Incinor, a gas-fired disposal plant for garbage and rubbish. Its length is 40 inches, width 28 inches, and height 36 inches. Other specifications are as given below:

Outer shell: sheet iron, lining; cast iron, corrugated to allow free air to come in contact with burning materials at all times; air space of one inch between outer shell and inner lining.

Cover: Cast iron, counter-balanced; cover, 22 inches by 22 inches.

Agitation lever: feature which permits the loosening of the material after shrinkage has taken place.

Burners: two in number; drilled pipe type may be operated individually or together.



Grates: saw-tooth arrangement, giving considerable grate area.

Dumping grates: two in number; operated separately, on either side of the Incinerator.

Vent pipe: ten inches.

Shipping weight: 1200 pounds.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge.

HELP WANTED

A large Gas Company, operating in a large Western City, desires to secure the services of an experienced Industrial Fuel Engineer. He must have the knowledge to sell gas for industrial purposes in competition with other fuels and make tests, reports, and installations. In replying, please furnish in first letter, experience, age, education, references and salary expected. Address Box A-10, care of *Western Gas.*

Situations Wanted

Note: *Western Gas* will publish free of charge, under this heading, advertisements of situations wanted. Maximum length, 50 words; additional space at classified rates five cents per word per insertion. Copy should be neatly typewritten on one side of paper only, and should be mailed to reach *Western Gas* not later than the 20th day of the month prior to publication date.

Natural Gas Man—Can install and operate gas plant, repair and test meters and gas wells. Has own bookkeeper; also assistant gas man who knows the business. Best of references. What have you to offer? Address Box A-6, care of *Western Gas.*

Gas man of 20 years experience with coal, water and oil gas, in both East and West. Has been superintendent of both operation and distribution for a number of years. Best of references. Address Box A-7, care of *Western Gas.*

Accountant and auditor—now employed, desires change. Is capable of taking complete charge of an office, installing modern accounting system and handling any other work in the various departments of a distributing company. Thirty-eight years of age, married and can give best of references. Address Box A-9, care of *Western Gas.*

LOS ANGELES MANAGER

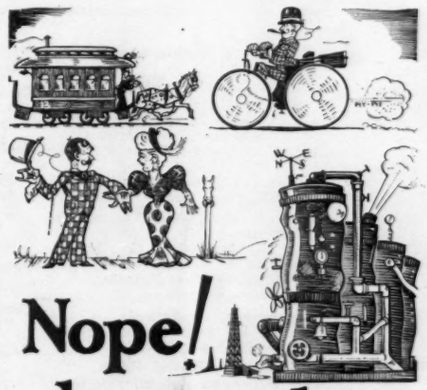
Herbert G. Day has been appointed manager of the Los Angeles plant of the Pacific Meter Works.

PHILLIPS PETROLEUM BEGINS ANOTHER GASOLINE PLANT

Material is being assembled at Sanford, Texas, for another casing head gasoline plant by Phillips Petroleum.

3-MINUTE SPEAKERS

Pearl Lentz and Stanley Wade will represent the Southern California Gas Company in the Pacific Coast Gas Association's three-minute speaking contest at the Santa Cruz convention in September. These contestants were selected as winners in a company contest held on June 17.



Nope! by-gone days *are* still here for some Absorption Plants !!

In the early days of gasoline production—and not so very long ago—almost any kind of baffle tower was used.

Some absorption plant operators are still clinging to the obsolete while others are profiting by the installation of Campbell Oil-Froth Absorbers. If your plant is out-of-date let Campbell efficiency step in and increase your profits.

J. A. Campbell

Consulting—Designing—Constructing

P. O. Box 669 Natural Gas Engineer Long Beach, Calif.

CAMPBELL OIL FROTH absorber

WESTERN GAS
626 South Spring Street,
Los Angeles, California .....192.....

Starting with the next monthly issue, you may send WESTERN GAS to the undersigned. Upon receipt of invoice, remittance will be sent to cover (1 year $2.00) or (3 years $5.00).

Name ..... *Title* .....

Company .....

Address .....

City and State .....

Please Check

[ ] GAS COMPANY [ ] GAS APPLIANCES
[ ] NATURAL GASOLINE CO. [ ] MISCELLANEOUS

Subscription: 1 Year, $2.00; 3 Years, $5.00, in Advance

A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Baker Iron Works.
C. F. Braun & Co.
Chaplin-Fulton Mfg. Co.
Fluor Construction Co.
J. A. Campbell.
Jensen Instrument Co.
Southwestern Engineering Corp.
The E. A. Key Company
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
S. Herbert Lanyon
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Abrasives
Abrasive Engineering Corp'n.

Acetylene, Dissolved
Commercial Acetylene Co.

Adjustable Plugs
Lattimer-Stevens Co.
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
W. P. Fuller & Co.
Hill, Hubbell & Co.
The Paraffine Co.s, Inc.

Analyzers
C. F Braun & Co.
A. R. Maas, Laboratories.
Smith-Emery Co.

Annealers (Bar, Blank, Strip)
Pacific Meter Works.

Anti-Fluctuators
Pacific Meter Works.

Apparatus, Experimental Gas
The Alpha-Lux Co., Inc.
Pacific Meter Works.

Appraisals and Valuations
Smith-Emery Co.

Automobile Tires
Truck Tire Service Co.

Bags, Gas Main
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
Mueller Co.
Safety Gas Main Stopper Co.
Semet-Solvey Engr. Corpn.

Barometers
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
General Gas Light Co.

Blast Gates
Montague Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Blocks and Tiles, Fire Clay
The Alpha-Lux Co., Inc.
American Refractories Co.
Los Angeles Pressed Brick Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.
S. Herbert Lanyon.

Blowers and Boosters
Ingersoll-Rand Co.

Blowpipes
Montague Pipe & Steel Co.

Boiler—Brickwork
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
C. B. Babcock Co.
Baker Iron Works.
Montague Pipe & Steel Co.

Boiler Settings, Pipe and Boiler Insulation
S. Herbert Lanyon.
Pioneer Paper Company.
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.

Boilers, Water Tube
Baker Iron Works.
Montague Pipe & Steel Co.
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Boxes
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Brass (rods, sheets, tubes, wire)
Mueller Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
Western Pipe & Steel Co.

Brick, Firebrick
Abrasive Engineering Corp'n.
The Alpha-Lux Co., Inc.
American Refractories Co.
Los Angeles Pressed Brick Co.
S. Herbert Lanyon.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Brick, Firebrick—Installation
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Abrasive Engineering Corp'n.
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
Western Pipe & Steel Co.

Burners, High Pressure
S. Herbert Lanyon.
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B. Babcock Co.
General Gas Light Co.
Johnson Gas Appliance Co.
S. Herbert Lanyon.
Lee B. Mettler.
Payne Furnace & Supply Co.
Rotary Manufacturing Co.
Standard Gas Equipment Corp.

Burners—Oil
Rotary Manufacturing Co.

By-product Recovery Apparatus
Oliver Continuous Filter Co.
Semet-Solvay Engr. Corpn.

Calorimeter Accessories
Pacific Meter Works.

Calorimeters
The Alpha-Lux Co., Inc.
Pacific Meter Works.

Cases, Meter
Pacific Meter Works.
Pittsburgh Meter Co.

Casinghead, Gas Meters
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Meter Co.
The Foxboro Co., Inc.

Casing and Tubing (steel)
Montague Pipe & Steel Co.
Semet-Solvay Engr. Corpn.
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
Semet-Solvey Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Castings
Philadelphia Steel & Iron Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Cement
Abrasive Engineering Corp'n.
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Cement—Plastic
Pioneer Paper Company.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
Semet-Solvay Engr. Corpn.

Checker Brick
Abrasive Engineering Corp'n.
American Refractories Co.
Los Angeles Pressed Brick Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
The Alpha-Lux Co., Inc.
Pacific Meter Works.
Stauffer Chemical Co.
Westcott & Greis, Inc.

Chemists, Analytical
A. R. Maas, Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
American Refractories Co.
Los Angeles Pressed Brick Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Semet-Solvay Engr. Corpn.

Coal Tar Products and Chemicals
W. P. Fuller & Co.
A. R. Maas, Laboratories.
The Paraffine Co.s, Inc.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Lattimer-Stevens Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Coils and Bends
Philadelphia Steel & Iron Co.

Collectors, Dust
Western Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Compressors, Air
The C. & G. Cooper Co.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.
Robertson & Company.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.
Robertson & Company.

Condensers
Baker Iron Works.
C. F. Braun & Co.
Ingersoll-Rand Co.
S. Herbert Lanyon.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Condenser Boxes
Baker Iron Works.

Condenser Tubes
Semet-Solvay Engr. Corpn.

Controllers
Jensen Instrument Co.
The Foxboro Co., Inc.

Controlling Devices, Electric
L. R. Teeple Co.

Controls, Air and Steam
Jensen Instrument Co.
S. Herbert Lanyon.
C. F. Braun & Co.
The Foxboro Co., Inc.
S. Herbert Lanyon.
Steere Engineering Co.
L. R. Teeple Co.

Cooling Systems
S. Herbert Lanyon.
Semet-Solvay Engr. Corpn.

Cooling Towers
C. F. Braun & Co.
Fluor Construction Co.
J. B. Gill Corporation.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Counters, Revolution
Jensen Instrument Co.

Couplings
Pittsburgh Meter Co.

Coverings (Tank, Boiler, Cold and Steam Pipe)
The Paraffine Co.s, Inc.
Pioneer Paper Company.

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.
Robertson & Company.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressor
The C. & G. Cooper Co.
Semet-Solvay Engr. Corpn.

Dephlegmaters
C. F. Braun & Co.
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Meter Co.

Diggers, Clay
Ingersoll-Rand Co.
Robertson & Company.

Discharging Machines (retort, etc.)
Semet-Solvay Engr. Corpn.

Displacement System, Tar
Semet-Solvay Engr. Corpn.

Ditcher
Robertson & Company.

Door, Clean-out
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

Dryers
Payne Furnace & Supply Co.

Elevators
Baker Iron Works.

Engineers and Engineering Service
J. B. Gill Corporation.
A. R. Maas, Laboratories.
Smith-Emery Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Engines, Diesel
The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Oil
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Steam
Ingersoll-Rand Co.

Evaporating Apparatus
C. F. Braun & Co.
United States Cast Iron Pipe and Foundry Co.
S. Herbert Lanyon.
Southwestern Engineering Corp.

Excavators, Ditch and Trench
Robertson & Company.

Exchangers, Heat
Baker Iron Works.
C. F. Braun & Co.
S. Herbert Lanyon.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Exhausters
Ingersoll-Rand Co.
S. Herbert Lanyon.
United States Cast Iron Pipe and Foundry Co.

Experimental Apparatus
S. Herbert Lanyon.
Pacific Meter Works.

Extractors
Semet-Solvay Engr. Corpn.

Extinguishers, Fire
American La France Fire Engine Co.

Faucets, Drain
Mueller Co.

Felt—Deadening
Pioneer Paper Company.

Filters
S. Herbert Lanyon.
Oliver Continuous Filter Co.
United States Cast Iron Pipe and Foundry Co.

Fire Clay and Products
The Alpha-Lux Co., Inc.
American Refractories Co.
S. Herbert Lanyon.
Los Angeles Pressed Brick Co.
Stockton Fire Brick Co.

Fire Brick Contractors
J. T. Thorpe & Son, Inc.
Stockton Fire Brick Co.

First Aid Equipment
American La France Fire Engine Co.

Fittings
Hoffman Supply Co.
Philadelphia Steel & Iron Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Fixtures, Lighting (Domes, Portables, etc.)
C. B. Babcock Co.
Welsbach Company.

Flashlights and Batteries
The Paraffine Co.s, Inc.

Feed Water Heaters
C. F. Braun & Co.
S. Herbert Lanyon.
Southwestern Engineering Corp.

Fire Brick
Abrasive Engineering Corp'n.
The Alpha-Lux Co., Inc.
American Refractories Co.
S. Herbert Lanyon.
Los Angeles Pressed Brick Co.
Stockton Fire Brick Co.
Semet-Solvay Engr. Corpn.

Flanges
Hoffman Supply Co.
Montague Pipe & Steel Co.
Philadelphia Steel & Iron Co.
Pittsburgh Meter Co.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.
S. Herbert Lanyon.

Floodlights

Flooring—Industrial
Pioneer Paper Company.

Forged Steel Pipe Flanges
Philadelphia Steel & Iron Co.

Forgings
Baker Iron Works.
Philadelphia Steel & Iron Co.
S. Herbert Lanyon.
Payne Furnace & Supply Co.
Potter Radiator Corporation.
Pacific Gas Heating Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

August

13th

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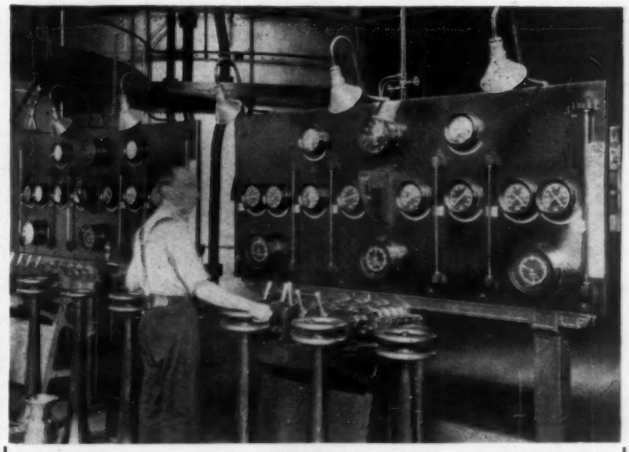

Installation of Foxboro Instrument on Generator Control Board.

Foxboro Instruments Are Used by the Leaders

Here we see the generator control board of one of the largest gas companies on the Pacific coast. All indicating gauges and clocks on these boards are Foxboro Instruments.

The operator has displayed before him accurate information concerning all phases of operation. Guess work is eliminated. Exact, scientific control is possible.

This is only one of many places in gas plants where Foxboro Indicating, Recording and Controlling Instruments are used. These nationally known instruments are guaranteed permanent in calibration and are accurate to within less than 1 per cent of total scale range. They are backed by a national sales and engineering organization. A branch office is located conveniently near you.

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Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Potter Radiator Corporation.

Furnaces, Lead Melting
C. B. Babcock Co.
Johnson Gas Appliance Co.
Mueller Co.
Payne Furnace & Supply Co.
Potter Radiator Corporation.

Gas Analysis Apparatus
Jensen Instrument Co.
Pacific Meter Works.
The Foxboro Co., Inc.

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Gas Main Tapping & Drilling Machines
Mueller Co.

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Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.
The E. A. Key Company

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W. P. Fuller & Co.
E. A. Key Co.

Gasometer
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Semet-Solvay Engr. Corpn.

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Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

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Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Gauges, Steam
Jensen Instrument Co.
Semet-Solvay Engr. Corpn.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Gauges, U Type
C. B. Babcock Co.
Jensen Instrument Co.
Lee B. Mettler.
Pacific Meter Works.
Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

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Commercial Acetylene Co.

Generators, Water Gas
Baker Iron Works.
Semet-Solvay Engr. Corpn.

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Westcott & Gries, Inc.

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Connelly Iron Sponge & Governor Co.
Pacific Meter Works.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

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Ingersoll-Rand Co.

Hanger, Meter
Mueller Co.

Hangers, Iron and Steel
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Philadelphia Steel & Iron Co.

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Baker Iron Works.
C. F. Braun & Co.
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New Way Mfg. Co.
Pacific Gas Heating Co.
Payne Furnace & Supply Co.
Potter Radiator Corporation.
Welsbach Company.
John Wood Mfg. Co.

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Electrogas Furnace Co.
General Gas Light Co.
Pacific Gas Heating Co.
Payne Furnace & Supply Co.
Potter Radiator Corporation.

Heaters, Wall
C. B. Babcock Co.
General Gas Light Co.
Pacific Gas Heating Co.
Payne Furnace & Supply Co.
Potter Radiator Corporation.

Heat Exchangers
Baker Iron Works.
C. F. Braun & Co.
S. Herbert Lanyon.
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

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S. Herbert Lanyon.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

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Ingersoll-Rand Co.

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Baker Iron Works.

Holders, High Pressure
Baker Iron Works.
Western Pipe & Steel Co.

Hoppers
Montague Pipe & Steel Co.

Hose, Air
Ingersoll-Rand Co.

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Johnson Gas Appliance Co.
Geo. D. Roper Corporation.

Hygrometers
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The Foxboro Co., Inc.
Westcott & Greis, Inc.

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The Kleenburn Co.
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Western Pipe & Steel Co.

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J. N. J. Firebrick Co.
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Westcott & Greis, Inc.

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National Meter Co.
Pacific Meter Works.
The Foxboro Co., Inc.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

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W. P. Fuller & Co.
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Stockton Fire Brick Co.

Joint Runners Asbestos
Safety Gas Main Stopper Co.

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J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Kilns—Brickwork
J. N. J. Firebrick Co.

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S. Herbert Lanyon.
Westcott & Greis, Inc.

Ladles, Hot Metal
Mueller Co.
Philadelphia Steel & Iron Co.

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General Gas Light Co.
Welsbach Company.

Lighters
C. B. Babcock Co.
Tappan Stove Co.

Lighting Incidentals
C. B. Babcock Co.
Welsbach Company.

Line Pipe—Iron
South Chester Tube Company

Line Pipe—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Linings—Brickwork
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Linings—Car
Pioneer Paper Company.

Main, Bags
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mains, Street
United States Cast Iron Pipe and Foundry Co.

Main, Stopper
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mantles, Gas Lighting
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Manometers
Jensen Instrument Co.
Lee B. Mettler.
Westcott & Greis, Inc.

Meters, Air
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Boiler
Jensen Instrument Co.
Pittsburgh Meter Co.
The Foxboro Co., Inc.

Meters, Burner Test
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Cast Iron Gas
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meter Connections
Lattimer-Stevens Co.
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Complaint
Pacific Meter Works.
Pittsburgh Meter Co.

Meters, Consumers
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Flow
Jensen Instrument Co.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Fluid
Jensen Instrument Co.
National Meter Co.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Gas
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Gasoline and Oil
Jensen Instrument Co.
National Meter Co.
Pittsburgh Meter Co.
Westcott & Greis, Inc.

Meters, High Pressure Distribution
Jensen Instrument Co.
Pittsburgh Meter Co.
Pacific Meter Works.
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, High Pressure Iron Case
The E. A. Key Company
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Industrial Consumers
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Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, Iron Case
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Laboratory
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Large Capacity
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Oil
Jensen Instrument Co.
National Meter Co.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Orifice
Jensen Instrument Co.
S. Herbert Lanyon.
Pacific Meter Works.
Pittsburgh Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Oxygen
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Oxygen and Hydrogen
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meters, Prepayment
Pacific Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Meter Seals
Lattimer-Stevens Co.

Meter Shelves
Lattimer-Stevens Co.

Meter Swivels and Caps
Lattimer-Stevens Co.

Meters, Station
Pacific Meter Works.
Pittsburgh Meter Co.

Meters, Steam
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Test
National Meter Co.
Pittsburgh Meter Co.
Pacific Meter Works.
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Water
Jensen Instrument Co.
National Meter Co.
Pittsburgh Meter Co.
Westcott & Greis, Inc.

Meters, Wet Test
Pacific Meter Works.
Pittsburgh Meter Co.

Mixers, Gas and Air
C. B. Babcock Co.
Geo. D. Roper Corporation.
Pacific Gas Heating Co.

Oil Condenser Sections
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Semet-Solvay Engr. Corpn.

Oil, Diaphragm
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Over Heat Control
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Everlasting Paint & Sales Co.
Hill, Hubbell & Company.

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Pilots
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The Wilcolator Company

Pipe
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Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.
Western Pipe & Steel Co.

Pipe Compound
E. A. Key Co.

Pipe, Copper
Mueller Co.

Pipe Covering
Everlasting Paint & Sales Co.
Hill, Hubbell & Company.
The Paraffine Co.s, Inc.
Pioneer Paper Company.

Pipe Cutters
W. W. Strickler & Bros.

Pipe—Iron
South Chester Tube Company

Pipe—Steel
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South Chester Tube Company

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Semet-Solvay Engr. Corpn.

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C. F. Braun & Co.
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Producers, Gas
Semet-Solvay Engr. Corpn.

Provers, Meter
Pacific Meter Works.
Pittsburgh Meter Co.

Pumps
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Ingersoll-Rand Co.
Mueller Co.
Oliver Continuous Filter Co.
Pacific Meter Works.
Geo. D. Roper Corporation.
Safety Gas Main Stopper Co.

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Semet-Solvay Engr. Corpn.

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C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
A. R. Maas, Laboratories.
Stauffer Chemical Co.

Purifiers, Oil Absorption
Western Pipe & Steel Co.

Pyrometers (Indicating and Recording)
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Westcott & Greis, Inc.

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American Refractories Co.
C. B. Babcock Co.
General Gas Light Co.

Radiant Heaters
C. B. Babcock Co.
General Gas Light Co.
Pacific Gas Heating Co.
Welsbach Company.

Radiators, Gas-Fired
Pacific Gas Heating Co.
Potter Radiator Corporation.

Radiators, Gas-Steam
Pacific Gas Heating Co.

Ranges
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Detroit Vapor Stove Co.
Geo. D. Roper Corporation.
Standard Gas Equipment Corp.
Tappan Stove Co.

Ranges, Closed Top
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Geo. D. Roper Corp.
Standard Gas Equipment Corp.
Tappan Stove Co.

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Ingersoll-Rand Co.
John Wood Mfg. Co.
Montague Pipe & Steel Co.
Western Pipe & Steel Co.

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Pittsburgh Meter Co.
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Westcott & Greis, Inc.

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Ingersoll-Rand Co.

Refractory Materials
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The Alpha-Lux Co., Inc.
American Refractories Co.
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Los Angeles Pressed Brick Co.
Stockton Fire Brick Co.

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Arthur F. Erickson Co.
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L. R. Teeple Co.
The Wilcolator Company

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Mueller Co.
Reliance Mfg. Co.
Reynolds Gas Regulator Co.
Sprague Meter Co.
L. R. Teeple Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

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Mueller Co.
Shaffer-Welch Sales Corp.

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Connelly Iron Sponge & Governor Co.
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W. P. Fuller & Co.
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General Gas Light Co.

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Amer. Seamless Tube Corp.

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Montague Pipe & Steel Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

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S. Herbert Lanyon.
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Montague Pipe & Steel Co.
Western Pipe & Steel Co.

Shingles
Pioneer Paper Company.

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United States Cast Iron Pipe and Foundry Co.

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Montague Pipe & Steel Co.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

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Baker Iron Works.
Montague Pipe & Steel Co.
Western Pipe & Steel Co.

Steel, Alloy
Philadelphia Steel & Iron Co.

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Baker Iron Works.
Montague Pipe & Steel Co.
Philadelphia Steel & Iron Co.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Steel Work, Structural
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Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Stills
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S. Herbert Lanyon.
Southwestern Engineering Corp.
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Mueller Co.
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Mueller Co.

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Systems, Hot Water Heat Control
Mueller Co.

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Western Pipe & Steel Co.

Tar Dehydrators
Semet-Solvay Engr. Corpn.

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The Foxboro Co., Inc.
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American Refractories Co.
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Stockton Fire Brick Co.

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Safety Gas Main Stopper Co.

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Jensen Instrument Co.

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Robertson & Company.

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The E. A. Key Company

Truck Tires
Truck Tire Service Co.

Tubes, Boiler
The E. A. Key Company
Semet-Solvay Engr. Corpn.

Tubes, Condenser
Semet-Solvay Engr. Corpn.

Tubing—Iron
Montague Pipe & Steel Co.
Muller & Co.
South Chester Tube Company
Semet-Solvay Engr. Corpn.

Tubing—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Unions
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Philadelphia Steel & Iron Co.
Pittsburgh Meter Co.

Valves, Back Pressure
C. B. Babcock Co.
Chaplin-Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Jensen Instrument Co.
S. Herbert Lanyon.
Reynolds Gas Regulator Co.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Valves, Electro-Magnetic
C. B. Babcock Co.
Arthur F. Erickson Co.
S. Herbert Lanyon.
Potter Radiator Corporation.
L. R. Teeple Co.

Valves, Gas Engine
The C. & G. Cooper Co.

Valves, Gate
Baker Iron Works.
Philadelphia Steel & Iron Co.
Semet-Solvay Engr. Corpn.

Valves, Needle for Gas Stoves
C. B. Babcock Co.
L. R. Teeple Co.

Valves, Relief
Chaplin-Fulton Mfg. Co.
Robertson & Company.
Connelly Iron Sponge & Governor Co.
Jensen Instrument Co.
S. Herbert Lanyon.
Mueller Co.
Reynolds Gas Regulator Co.

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Lattimer-Stevens Co.
Merco Nordstrom Valve Co.

Valves, Thermo
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Vent Pipe
Mueller Co.

Vulcanizers (Tube) Gas
Reliance Mfg. Co.

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Beacon Water Heater Co.
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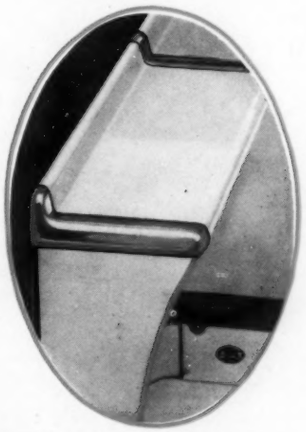

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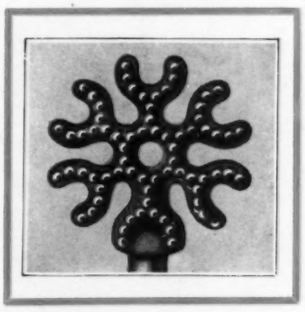

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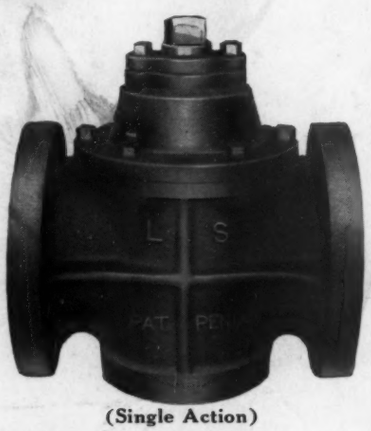

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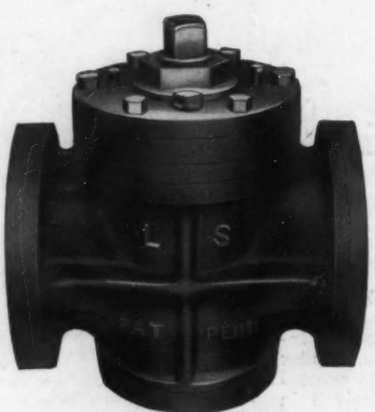

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